EDISON ELECTRIC INSTITUTE BULLETIN

JUNE, 1941

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EDISON ELECTRIC INSTITUTE

THE ELECTRIC LIGHT AND POWER INDUSTRY

Current Statistical Data Covering 100 Per Cent of Industry

JANUARY, FEBRUARY AND MARCH 1941

	MARCH	FEBRUARY	JANUARY
	SOURCE AND DISPOSAL OF ENERGY		
Generation* (Net)			
By Fuel Burning Plants	8,979,294,000	8,381,091,000	9,054,075,000
By Water Power Plants	4,405,192,000	3,912,077,000	4,586,756,000
Total Generation	13,384,486,000	12,293,168,000	13,640,831,000
Add—Net Imports Over International Boundaries			
Less—Company Use			
Less—Energy Used by Producer	NOT	YET	AVAILABLE
Net Energy for Distribution			
Losses and Unaccounted For			
Sales to Ultimate Customers (Kwhr.)	**10,895,228,000**	**10,801,399,000**	**11,382,383,000**
	CLASSIFICATION OF SALES		
Number of Customers			
Residential or Domestic	25,097,009	25,028,540	24,966,640
Rural (Distinct Rural Rates)	912,276	905,234	901,242
Commerical or Industrial			
Small Light and Power	4,245,557	4,241,874	4,245,270
Large Light and Power	172,217	172,356	173,985
Other Customers	118,052	117,631	117,635
Total Ultimate Customers	**30,545,111**	**30,465,635**	**30,404,772**
Kilowatthour Sales			
Residential or Domestic	2,060,243,000	2,194,845,000	2,396,319,000
Rural (Distinct Rural Rates)	117,186,000	123,094,000	130,274,000
Commercial or Industrial			
Small Light and Power	1,924,313,000	2,008,816,000	2,126,262,000
Large Light and Power	5,749,779,000	5,455,722,000	5,615,546,000
Street and Highway Lighting	179,481,000	185,163,000	214,554,000
Other Public Authorities	247,982,000	251,081,000	254,110,000
Railways and Railroads			
Street and Interurban Railways	365,854,000	350,011,000	385,625,000
Electrified Steam Railroads	186,708,000	169,349,000	194,390,000
Interdepartmental	63,682,000	63,318,000	65,303,000
Total To Ultimate Customers	**10,895,228,000**	**10,801,399,000**	**11,382,383,000**
Revenue from Ultimate Customers	**$212,602,700**	**$217,628,900**	**$228,158,900**
	RESIDENTIAL OR DOMESTIC SERVICE (Revised Series)		
Average Customer Data—(For the 12 Months Ended)	**(March 31st)**	**(February 28th)**	**(January 31st)**
Kilowatthours per Customer	964	961	958
Average Annual Bill	$36.73	$36.71	$36.69
Revenue per Kilowatthour	3.81¢	3.82¢	3.83¢

* By Courtesy of the Federal Power Commission.

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EDISON ELECTRIC INSTITUTE BULLETIN

Volume 9 JUNE, 1941 No. 6

The Institute's Ninth Annual Convention

WITH the national defense effort and the present and post-war problems of the electric industry as ever-present thoughts in the minds of those attending the Ninth Annual Convention of the Institute and with these subjects as the dominating themes for the business sessions, the Convention, held at Buffalo, June 2-5, provided clarification of many aspects of the situation and offered reliable charts for constructive action in overcoming many of the difficulties confronting the utilities.

Problems of the industry were squarely faced; yet it was apparent that the mood of those present was in the grand tradition of the pioneers of the industry who, with faith in the future and determination to succeed, carried forward, against all obstacles and hardships, to build up the world's greatest and most efficient development of electricity supply.

Reassurance to the nation that the promise made at last year's convention that the government can count upon the whole-hearted cooperation of the electric utility industry in providing an adequate power supply for national defense was implicit throughout the speeches of utility representatives; and reemphasized in the expressions of confidence from national defense officials that the industry will accomplish whatever is asked of it in the defense program.

Approximately 1000 delegates and guests attended the Convention. Four business sessions and a luncheon meeting were held; a number of committees conducted one or more well-attended meetings. A meeting of the Board of Trustees was held on Wednesday and the Operating Committee met Tuesday. Other committees holding meetings at which plans for activities for the coming year were charted included the Accounting Executive Committee, Depreciation Committee, Executive Committee, the Plan Committee of the Modern Kitchen Bureau, General Sales Committee, Rate Research Committee and the Statistical Committee.

All officers of the Institute and all members of the Board of Trustees were re-elected. J. C. Leighton, Treasurer of the Engineers Public Service Company, was elected Treasurer of the Institute to fill the recent vacancy in that office. Two new members were elected to the Board of Trustees, Dr. William McClellan, President of the Union Electric Company of Missouri and D. C. Barnes, President of the Engineers Public Service Company.

A musical program featuring Rose Bampton, leading soprano of the Metropolitan Opera Association filled the Kleinhans Music Hall to capacity on Tuesday evening; a bus trip along the Niagara Frontier to Niagara Falls on Wednesday afternoon proved attractive to many; and several informal gatherings sponsored by both the Institute and manufacturers provided opportunity for informal discussion and recreation.

Pleasant weather, a most hospitable reception by the city of Buffalo and the attention and helpfulness of the official hosts of the convention, the General Convention Committee composed of utility executives of the western New York area, all added greatly to the enjoyment of the Convention. The Convention Committee included Colonel William Kelly, Buffalo Niagara and Eastern Power Corp.; Herman Russell, Rochester Gas and Electric Corp., Ralph D. Jennison, New York State Electric and Gas Corp.; John L. Haley, Central New York Power Corp.; T. W. Connette, New York State Electric and Gas Corp. and M. E. Skinner, Buffalo Niagara Electric Corp.

First General Session

The first general session was opened Tuesday morning with a report on Institute finances which showed the cash position of the Institute as good with sufficient funds on hand to pay operating expenses for the remainder of the year. This report was followed by Mr. Kellogg's presidential address which is printed in full in this issue.

The recognition of "plus values" in the electric utility's sales and service efforts, rather than price-cutting, in order to meet subsidized competition, was recommended by the next speaker, Tom P. Walker, President, Gulf State Utilities Company, Beaumont, Texas.

"The utility industry has no chance whatever of winning a price-cutting war with the government of the United States in its present state of mind," Mr. Walker maintained, while the "plus value" approach retains all the necessary elements of quality, with a reasonable price to pay for that quality. It is this approach that has brought success to those businesses which today we recognize as leaders for all the world. "It is only through this approach—the adding of plus values to our sales and service—that we may find some hope in our situation," he said.

Among the plus values stressed by Mr. Walker are:

"(a) Rates as low as economically feasible, but—and this is more important—of such design that they promote the widest possible use of our product; (b) an aggressive sales program either by the company or company-promoted through dealers; (c) intensified personal attention to the individual customer through company representatives having sufficient intelligence and training to handle to conclusion a maximum number of customer requirements on the first contact; and (d) a spirit of cheerful optimism and helpful service on the part of all personnel, expressed by more human understanding of the personal needs for service of our customers."

"Let's charge rates that will keep our companies and physical properties in a healthy condition to give dependable service," said Mr. Walker. Design them to encourage greater use of our service, and aggressively merchandise yourself and through dealers so that the average rate earned by most customers will be fairly in line with private and public competition," he said.

Splendid leadership and full co-operation by industry are making the defense production drive successful despite bottlenecks and discouragements, asserted the next speaker, W. P. Witherow, president of Blaw-Knox Company and chairman of the National Defense Committee of the National Association of

Manufacturers. Expressing his conviction that government spokesmen have been very conservative in their reports of progress, Mr. Witherow predicted that "by the end of this year, there will be such a whirl of activity in the production lines of our country that all records of all kinds . . . of any country . . . at any time . . will be exceeded, and American industry will show its people results which they know it is capable of accomplishing."

Conceding that the job ahead will require great sacrifice and will effect certain changes in our society, the N.A.M. defense chairman rebuked those who would let such considerations hinder an all-out defense effort.

This session was concluded with the presentation of the Charles A. Coffin award to the Wisconsin Public Service Corporation and ten other groups of awards and prizes commemorating accomplishments of distinction by companies and individuals in the electric industry. Presentation ceremonies were conducted by James E. Davidson, President of Nebraska Power Company and members of the Prize Awards Committee of EEI. Mr. Davidson's report of the Prize Awards appears in this issue.

Second General Session

The new demands for electric power by defense industries are not a problem to the utility distribution engineer, because they generally allow time for normal planning, buying and installing the necessary equipment. It is the gradual increase of load in many small increments that makes the distribution engineer glad that he has some "rubber" in his equipment, T. G. Hieronymus, Kansas City Power and Light Company, told the convention in the opening address of the second general session.

Load increases are coming from the most unexpected places, Mr. Hieronymus continued, adding that the small manufacturing plants on the side streets or in the light-industry sections of the cities are being greatly affected by the defense program. Manufacturers who have struggled to make a bare living since the depression are now working nights turning out products for defense.

"The resourcefulness, thinking and general ability of the utility engineers of the country has kept them very flexible. Not once has there been a note of pessimism or defeatism at any of our meetings. On the other hand, there has been a very definite feeling of optimism. They have so kept up their systems during normal times that they are now ready to do their bit in the national emergency with which they are confronted," Mr. Hieronymus concluded.

Rapidly increasing electric load on the lines of the nation's power companies makes it necessary to give careful consideration to the distribution systems, particularly from the standpoints of flexibility and adaptability to meet long-range programs, said the next speaker, M. W. Smith, Vice-President in Charge of Engineering, Westinghouse Electric and Manufacturing Company.

It is in the distribution of power, rather than in the power generating stations, that the utility industry must study the problem of reduction of costs, Mr. Smith continued, pointing out that the distribution investment has steadily increased.

"As the load increases, our mutual job is to utilize the existing investment most effectively and to provide means for expanding it economically," he said, as he turned to several specific possible courses of action.

Greater flexibility in meeting shifting load requirements is needed. To this end, the portion of the expense tied up to specific locations should be kept to a minimum.

Future system modifications and extensions should be planned so as to increase investments in small increments as local bottlenecks develop, he stated. Large expenditures for applications such as large substations where the equipment may remain lightly loaded for a long time until the load builds up, should be avoided, he warned, urging the use of the self-contained, small unit substation with low installations costs to meet this condition.

A plea for conservatism in the electric utility company's investment in distribution systems was made in a paper by E. S. Fields, Manager, Electric Department, Cincinnati Gas and Electric Co. and read by Frank Sanford of the company.

"It is recognized generally that the keynote of our distribution operation now is to make the most possible use of our present investment. . . . New equipment, new devices, and new methods are important, but they should be applied and used only if they pass the test of sound economics and necessity for the particular system condition. We can afford to add to our investment only to carry more load or to improve some condition which cannot be helped by changes with the present investment," Mr. Fields said.

One of the electric industry's major problems for some time to come, according to the speaker, will be to continue the increase in the sale of energy without increasing proportionately the investment to serve. While it would be possible to even double the investment in distribution, no increase in investment is justified unless it is accompanied by a profitable increase in energy sales or is applied to a system that has not been developed progressively to keep pace with the service requirement for the present load condition, he said.

The distribution engineer, perhaps more than any other, is "on the spot" A. E. Silver, Ebasco Services Inc., said in continuing the discussion on distribution problems. The distribution systems of the electric utilities in the United States are being called upon to deliver energy at customers' premises in an aggregate more than 15 per cent ahead of one year ago, and this rate appears to be accelerating.

The distribution engineer is called upon by conservation and economy to find means of making facilities, already built for rendering service to more than 30,000,000 customers, do more work at lower cost per unit.

Recent engineering developments, Mr. Silver stated, are often assisting the distribution engineer by yielding increased capabilities of existing facilities, increased economies in operation and lower costs for new extensions. These gains, he said, though spurred by exigencies of abnormal conditions, will be permanently enduring, it is believed.

The concluding event at this session was an off-the-record talk by Constantine Brown, foreign affairs editor of the Washington Star, who analyzed the foreign situation and its implications in relation to the United States.

Third General Session

"Future peace-time markets can be safeguarded only by sustained or intensified sales efforts, continued advertising, and maintaining the best service policy commensurate with war conditions. Only thus can we cushion the economic blows another armistice inevitably will bring," R. E. Fisher, Vice-President, Pacific Gas and Electric Company, told the convention in the opening address of the third general session.

Analyzing the responsibilities of sales departments in these changing and critical times, Mr. Fisher stated that a sound economy is as vital as a sound military defense. The great mass of people must be kept on working, earning and buying, for, said Mr. Fisher, if business is to bear the heavier tax burden imposed upon it by the preparedness program, we've got to have good business in the most literal sense of the word. "In addition to whatever abnormal jobs we are called upon to do, we must also carry on as best we can to serve our regular markets and to develop new ones."

Mr. Fisher urged that the electric industry continue to build load with emphasis on fuller use of existing facilities. With a use factor that is still below 40 per cent, Mr. Fisher stated that if the valleys in the load curve can be filled, the present generating capacity can comfortably furnish many more kilowatt-hours without danger of shortage. Extreme difficulties in the way of further technical gains in efficiency, competition with subsidized Government systems and rates so low that net revenues are constantly threatened present challenges to the electric industry that can be best met by building new load and, to a large extent, keeping existing business sold, he said.

Utility men, as well as appliance and equipment manufacturers, are looking ahead to the day when war orders or defense requirements will be through. . . . Even though only a small portion of the factory output

or plant capacity is left to be sold to the public today, the only sound long-range course is sustained selling and advertising, he said.

"Our industry should ask at this time 'what's the job' and not 'what's the use.' There is no use whatever in asking 'what's the use.' We know there is all the use in the world in asking 'what's the job.' That is the responsibility of sales," Mr. Fisher concluded.

"Low cost housing may prove to be the approaching industrial activity to cushion the wars aftermath," Henry J. Morton of the John B. Pierce Foundation, New York City, told the Convention.

Adding that an active home building industry will be a valuable contribution to offsetting the reaction and the aftermath of what is now happening, Mr. Morton said that "American ingenuity should be able to arise to the occasion and very shortly produce the low cost home comforts for that mass population which has heretofore been denied these privileges."

A pre-fabricated home, developed after exhaustive tests by the Pierce foundation and designed for the low-income family, was described by the speaker as now available at a price within the reach of the $25.00 a week worker. Builders are now being licensed to build these patented homes.

W. L. Batt, Deputy Director, Production Division, OPM told the convention of the efforts being made to meet defense production and to meet the shortage of raw materials.

"We will have to look on defense as our first, our vitally first job, coming before anything else, coming before recreation, coming before comfort, coming before civilian necessity, and then letting the other things fall in behind as best they can be made to fit," the OPM spokesman said.

"With that approach, I am satisfied that we can do our end of this job, so enormously big that few of us have any conception of its size," he continued. "I simply remind you that there are outstanding today defense commitments amounting to approximately $45,000,000,000 on American industry or presently to come to industry. That amount, I think, will be increased and we shall be spending, in my belief, indeed in my hope, 25 per cent of our national income, as soon as possible, for the preparation of defense materials instead of 1 per cent or 2 per cent, or 5 or 10 per cent, as we have been so recently doing.

"Now when we see the job in those terms, then we can do it," Mr. Batt insisted. "Until we do see it in those terms, I think we shall have made an inadequate approach."

All-out selling during the post-war period will be the only aid to businesses that are now expanding their facilities for all-out production, C. E. Greenwood, Commercial Director, Edison Electric Institute, predicted in the concluding address of the session.

"During World War Number 1," Mr. Greenwood reminded his audience, "the productive facilities of our country were pyramided to such a vast extent that with the conflict over, industry found itself in the immediate years following with factory equipment, the output of which it was quite impossible to distribute. Purchasing power was far above the average, but ability was lacking to market and consume goods in the amount available."

In solving this economic problem, the Institute's Commercial Director continued, industry developed new methods of marketing approach, in which new and increased emphasis was placed on the consumer and the products he wanted. "Particularly during the last decade, consumer wants have become the chief consideration in marketing procedure. A basic requirement in building volume output for industry is the readiness and ability of that industry to mould public opinion through faithful interpretation of such accurate scientific facts on its service and products that will make the consumer 'want' them."

"Only volume use of electric service makes it possible for the company to offer, and for consumers to earn, the continuously lowered cost of service which has been one of the outstanding achievements of the electric industry," he emphasized.

Summing up specific national activities carried on through the E.E.I., Mr. Greenwood emphasized that it is "a national function of our Association to tackle every electric service to which it is desirable to apply an educational background to speed up local product selling. Each one of them serves distinct human needs and at the same time measurable commercial return results, which help pay for promotional costs."

Fourth General Session

Opening the fourth general session, Col. H. S. Bennion, Vice-President and Managing Director, EEI, reviewed the load and capacity situation in its relation to defense supply and suggested that private utilities must follow a four-point program to insure an adequate power supply for whatever expansion may come in the defense program.

Col. Bennion urged a careful study of industrial load and means to shift them around the clock for improvement in load factor; a new study of generating plant, in transmission and distribution facilities to learn to what extent present equipment can be forced if necessary; he asked the industry to keep well posted on load and capacity conditions in all neighboring territory to make additional interconnections as they may become useful in helping to assure an adequate power supply in all places and situations in and near the territory being served by the particular company.

Finally, Col. Bennion advised a reexamination of the types of customers being supplied with electricity to determine which ones could be curtailed if a real need should arise in the future.

If during a war emergency the United States can reach a 110 billion dollar national output, estimated for 1943, it can do it for peace; but it will have to work almost as many hours to do it, D. C. Prince, Manager, Commercial Engineering Department, General Electric Co., told the convention.

Analyzing the division of national income and output in 1940, a comparatively normal year, and that which will exist in 1943, when the defense program will be in full swing, Mr. Prince suggested that by 1942, "we shall have a total national output of $110 billions which will flow from the work of 55 millions of people working 46 hours a week," as compared with the national output of $82.2 billions of 1940, of which only about $2.7 billions were spent directly on national defense. In 1943, the defense effort will amount to $35 billions, Mr. Prince assumes, which will be spent for military equipment for this country and Britain.

By 1943, he estimated, of the total national output of $110 billions, business capital formation will increase from $9.2 billions to support the defense effort, residential construction and public works will be decreased from $5.5 to $4.0 billions, and spending for consumer durable goods will contract by 50 per cent, because of the unavailability of men and materials to make these products.

"Unless we are able to plan a program now that will enable us to replace the defense effort with productive peacetime activity," said Mr. Prince, "it is probable that a marked decrease in business activity will follow this war."

"Let us make a plan showing how we think the transition from a wartime to a peace time economy should be made. The plan should contemplate progressively higher standards of living brought about by greater power consumption. If it is a good plan, we should be able to sell it; but we will have to start soon if we expect to have our plan ready in time," Mr. Prince concluded.

Carl Snyder, author of "Capitalism the Creator," the next speaker, reminded his audience that "it is a vast delusion that we can somehow continue our present colossal scale of government expenditure, and by means of huge issues of bonds and by heavy taxation largely falling upon the rich, that we will, in the end, come out a gainer."

Contrasting the progress of former years with the "prolonged halt" over the past ten or twelve years, "with for all practical purposes, no industrial expansion, no increase in production, wealth or employment," Mr. Snyder added that during these years we have had vast sums of capital ready for investment, technological advances and many other factors which were ready to help industrial advances. "But the incentive was gone," he continued. "The joy of doing things, of achieving, of grappling with large undertakings," in his opinion were lacking.

Since it is only as capitalism becomes the servant of the people, giving them cheaper goods, higher wages, greater buying power, that it succeeds, he said, instead of trying to tax this wealth away from its possessors, imposing heavy duties on their estates, "we should endeavor to conserve it and promote it in every way possible."

"We have behind us a magnificent past.

Let us beware that we do not establish here the conditions which have created such insane delusions as prevail today in Germany," Mr. Snyder concluded.

"Interconnection and coordination of existing power systems will have a vital part in answering three outstanding questions as to defense power supply—How much?—How soon?—Where?" J. E. Moore, Ebasco Services Inc., said in the concluding address of this session.

Stating that the great power supply systems of this country have been created and developed by privately owned utility companies, Mr. Moore reiterated that the responsibility for power supply in this country today, in consequence, rests predominantly on private enterprises.

Emphasizing the importance of interconnecting power lines as a means of supplying the new power demands of 1942 and 1943, "which as to particular localities, are not even prospects now," Mr. Moore pointed out that "for operation in 1942, no new generating units of economic size, other than those now in process of construction, can be made available. For operation in 1943, the situation as to manufacturers' facilities and floor space, and as to critcial materials and skilled labor, definitely limits the aggregate capacity of new generating units which can be produced."

Eight potential benefits of interconnections were listed by Mr. Moore. The savings in generating capacity, by taking advantage of load diversity, resulting from the different times of the year in which territories have their greatest need of power; savings in generating capacity by reason of diversity in demands upon reserve facilities, and savings in production cost, when one power system might otherwise have high-cost capacity in use, and another system at the same time might have lower cost units idle or only partially loaded.

Interconnections make possible the staggering or rotating development of new capacity in the several systems, the flow of low-cost energy into an area where fuel may cost more than in others, and improvement in service, in some cases, in outlying portions of the systems between which the interconnection is made.

Mutual protection against breakdowns and emergencies, fuel shortage and unexpectedly heavy load increases, Mr. Moore stated, are another important advantage. "Conditions now foreseeable emphasize the importance of this type of benefit," he said.

Where water power generation of electriciy is involved, still further savings in capacity and operating costs may accrue from diversity in stream-flow characteristics between different watersheds, more effective use of water storage, and, in particular, more complete development and utilization of the low-load-factor type of hydro installation for the carrying of short peaks for a large interconnected system and for short duration emergency service, Mr. Moore said.

Luncheon Meeting

A change in the officially scheduled program was the appearance of Edward C. Eicher of the Securities and Exchange Commission as the speaker at the concluding event, the luncheon meeting, held on Thursday. Chairman Eicher, replaced Col. William J. Donovan, who had been scheduled to speak at the luncheon but was unable to attend. The gist of his message was that the SEC had no intention of abandoning its "death-sentence" program against holding companies in view of the national defense urgency.

Mr. Eicher stated five points of policy motivating the commission in its actions. They are: (1) The commission intends to enforce the act. (2) There is nothing in the law which requires the sale of any holding company assets at unfair or inequitable prices. (3) There is no frozen period of time in which orders under Section 11 (b) (1) and (2) must be carried out, and these orders are not self-enforcing but must have court authority for enforced compliance. (4) The sale of holdings in operating companies is by no means a losing proposition for the holding company and its security holders. (5) In many instances there will be no necessity for the sale of underlying securities in the general market.

After announcing these points Mr. Eicher strongly rejected the suggestion that has been heard recently to the effect that the response of electric utilities to defense needs might be facilitated by a moratorium on enforcement of the act until the present emergency is past.

Notes From the Epitaph of the Passamaquoddy Tidal Power Project

First Cost Estimate $39,871,000, Now Revised to $89,357,000

"THE applicant, Dexter P. Cooper, Inc., filed an estimate of the cost of Passamaquoddy Tidal Power Project, including the Haycock Harbor pumped-storage plant, with the Federal Emergency Administration of Public Works in the fall of 1933 in the amount of $39,871,000. . . .

"On the basis of such information as was then available, the Federal Power Commission's staff examined the estimate and increased it to $46,958,000, including interest during construction at 4 per cent. . . . Since that time, and while the project was under construction by the United States, extensive explorations and investigations of foundation conditions and of materials available for construction purposes, elaborate design studies, and laboratory tests were made by, or for, the War Department. In the light of this, the first really valuable information to be made available, utilized in connection with an independent study of the project, it has been found necessary very greatly to increase the estimate of cost. *It is now estimated that the cost of the project,* if constructed under this plan, including certain expenditures already made, *but not including interest during construction, would be $89,357,000.* . . . A discussion of increases in estimated costs of important project features, as compared with previously estimated costs, follows:

"*Dams:* In previously estimating the quantities of material required for the dams, it was assumed that the clay overburden constituting the ocean bed would have sufficient strength to support the structures. Subsequent laboratory tests have demonstrated conclusively that this foundation is not strong enough to support the weight of the dams and that consequently the material therein may be expected to settle extensively, displacing the clay in the mud wave. Core borings taken along the Eastport and Lubec Dam sites show the overburden to be as much as 130 feet and 67 feet in depth, with maximum depths of water at mean sea level of 120 feet and 57 feet respectively."

"*Gates:* The concrete sections proposed in the original design were relatively light. Experiments on concrete exposed to the action of sea water and the climatic conditions at the project site indicate that only a rugged type of construction would be suitable. Foundation conditions as indicated by subsequent surveys disclose rock at elevations, and of qualities, different from those which were previously supposed to exist. Corrosion tests made on steel and other metals indicate that a considerable extra thickness of metal must be used in gates and other metal parts. . . .

"*Power House:* Corrosion tests demonstrated that the so-called outdoor-type power plant previously proposed would be unsuitable at this location and that a superstructure for housing generation and other equipment would be necessary."

"*Pumped-storage plant:* . . . Subsequent surveys disclosed serious errors in the topographic maps used for locating the reservoir and for estimating the volume and cost of the dams necessary to impound the pumped water. Geological investigations, made after *construction of the project was commenced,* revealed the fact that material suitable for construction of the dams was not available in sufficient quantity in that immediate vicinity, and that the *proposed reservoir site was composed of pervious, glacial materials* through which leakage might occur to such extent as to involve serious water losses. . ."

—Excerpt from a letter from the Chairman of the Federal Power Commission, transmitting report on Passamaquoddy Tidal Power Project in Response to Senate Resolution 62 (76 Congress) Pages 9-12.

The President's Address

By C. W. Kellogg

President, Edison Electric Institute, New York, N. Y.

Address before the First General Session of the Ninth Annual Convention of the Edison Electric Institute, Buffalo, N. Y., June 3, 1941

THE year now ending has been one of the most fateful in history, both for our country and for our industry. When we met at Atlantic City a year ago, the country was just beginning to sense danger from abroad and the Defense Commission had just been authorized. Since then, the energies of the country have been concentrated into a great campaign of preparedness for defense, with a speed and thoroughness which the public still fails to comprehend.

The experience of the war in Europe has shown that modern warfare is essentially a matter of industrial production. The bravest and most patriotic of peoples are relatively helpless, without an adequate supply of airplanes, tanks, artillery and explosives. Even to begin the mass production of these, and the many articles allied with them, has required a huge construction program of buildings and machinery and the rapid accumulation of stocks of the necessary materials. It is gratifying to be able to report that this construction program is well ahead of schedule and, by midsummer, we, as a nation, shall be on a mass production basis on all of the materials needed for our own protection and for aid to Great Britain. With our national genius for industrial production, no nation on earth should be better able than ours to prepare to meet the challenge of aggression with mechanical weapons. We may be sure that our output will be commensurate with our industrial power.

All-Out Industrial Effort

Not only our wealth and industrial plant are being mobilized for the defense effort, but also our trained industrial leadership. Through the Defense Commission and, since January, the Office of Production Management, the industrial brains of the country have been brought in to help the Army and Navy with their huge task and they have worked together as a team with a growing appreciation of what each has to contribute to the common cause.

This great industrial effort naturally requires an adequate supply of electric power, not only to turn the wheels of

MR. KELLOGG

industry but also to supply the needs of the great electrochemical and electrometallurgical industries. The utilities as a group have 2,103,000 kilowatts of new generating capacity scheduled for completion in 1941, 2,459,000 kw in 1942 and already 827,000 and 180,000 kw respectively in 1943 and 1944. Adding to these figures the capacities projected by the Federal Government, and by District Authorities and municipalities, together with those of industrial companies, bring the totals of new generating capacity to:

1941	4,150,000	kilowatts
1942	3,430,000	"
1943	1,046,000	"
1944	668,000	"

The totals for 1941 and 1942, amounting to over 7,500,000 kw are, on account of the time required for construction, fairly complete, but the 1943 figures will continue to mount. They must do so in order to serve the further developments now being formulated.

The figures recently published in the U. S. Census (of Manufactures) show that in 1939 3/8 of the industrial energy of the country was generated by the industries themselves and only 5/8 of it purchased from central stations. It is logical therefore to include, in the total of new power available, the 670,000 kw of generating capacity to be installed by industrial establishments in 1941 and 1942.

The large totals of new power in 1941 and 1942, each exceeding by 50 per cent any past annual growth in demand and each being over five times as great as the annual demand growth during the first World War, are gratifying, but should lead us to no feeling of smug satisfaction, on account of the way the defense program continues to expand with the unfolding of the war drama.

There has been a lot of discussion during the period of defense preparation of the question of the adequacy of the power supply. I have avoided any formal statement on the subject both because the answer is so difficult to prove and because the situation has changed so continually. It has been a source of pride to me, as it must be of satisfaction to the public, to watch the score of new generating equipment continue to soar month-by-month to the totals now known. I shall refer to this point later.

Reports from companies serving a third of the total large light and power load, and representing perhaps half of the non-mechanical load served by electric utilities, show that they have already taken on 240,000 kw of such load and have in prospect 275,000 kw more. This includes electric furnace, electric melting and heating, electrolytic processes, exclusive of aluminum, etc.

Priorities

Developments in recent months have shown that merely budgeting costs, and placing orders for, generating equipment are not, by themselves, sufficient to bring new capacity into being. A power plant is a composite of many parts, each one not only essential to the finished product, but required to be available at the right time in the construction program. While, therefore, the placing of orders for equipment and materials long enough in advance is as necessary as it ever was, there still remains the matter of actually getting the goods and getting them on time. This has led to constantly mounting problems of priorities, which

have become the most pressing problem for many of our companies.

This subject, which was hardly mentioned eight months ago, has now become the very core of the defense effort. It has spread like a prairie fire; each new item to need and get preference rating, drags other related items into its orbit, and so the system continues to ramify and expand. The point has now been reached where, with many commodities, any item without some preference rating, is likely to be permanently pushed aside by the pressure on manufacturers to comply with the preference ratings applied to other work going through their shops.

Although not actually a part of the Priorities Division, questions of priority affecting electric plants have been referred to me for advice, so that in recent months priorities have taken up most of my time. Recently a special subcommittee, consisting of Mr. F. A. Schaff, president of the Superheater Corporation, and Mr. John C. Parker, of the Consolidated Edison Company of New York, has been set up in the Tools and Equipment Section of the Priorities Division to handle utility details—a move of great importance and value to the utility companies.

On account of the importance of the subject, I have advised all of our companies, whose priority claims have passed through my hands, that they must demonstrate their need for preference rating by the most rigid proof, giving defense power requirements by detail schedule, with names, amounts of power and purpose for which used, and tying this in with the growth of system peak loads and the size of the unit for which the preference rating is asked.

Non-Mechanical Electrical Requirements

In addition to the greater magnitude of the industrial power requirements for operating mechanically the expanded industrial machine, there has developed since the last war a great series of non-mechanical electrical requirements for electric furnace and electrolytic purposes. The largest of these is for aluminum, with steel and ferro alloys second and possibly magnesium third. The manufacture of synthetic rubber could, in future, require amounts of electric power second only to aluminum. A large part of these great special requirements, being solely for defense purposes, have been, or will be, largely carried by government plants. The T.V.A. upon recommendation of the O.P.M. has been authorized by Congress to add about 626,800 kw to its generating capacity and by February, the new government plants on the Columbia River will have over 600,000 kw installed, with more to come during 1942 and 1943. Indeed, of the huge aluminum load, which will be well over a million kw, only about 50,000 kw is expected to be supplied by privately owned utilities. These western plants whose output seemed a year ago to be almost unmarketable are being put to good use in the present defense emergency.

Adequacy of Power Supply

In considering the subject of adequacy of power supply, the elements of time, location and nature must be considered.

Taking up first the element of time: At the beginning of the defense preparations, the country faced a well nigh complete shortage of planes, tanks, guns, shell, explosives, cantonments and so on through the list of military requirements. The important question was not the actual shortage of these things which was obvious so much as the adequacy of the plans to acquire them in the shortest possible period. In the case of electric power, it was clear that the increased industrial effort needed to correct these shortages in materials, would require corresponding increases in power supply. The essential thing was the adequacy of the plans to supply this additional power in the shortest feasible time. On this point, the 7½ million kilowatts going in service during 1941 and 1942 would appear to be the true answer, rather than the conditions when the emergency arose or than the temporary conditions that may exist at times before the full new forces are made available.

The same may be said to some extent as to location. Our military authorities have deemed it wise strategy to spread the plants for producing defense material about the country. The extent to which shortages of power may have arisen in a few areas of intensive industrial development merely emphasizes lack of flexibility in decentralizing defense effort. The extent to which what would otherwise be a serious shortage of power for aluminum manufacture has been obviated, by utilizing the great government power developments on the Columbia River, is a measure of how vitally location of large defense power loads affects adequacy of power supply.

As to the nature of some alleged power shortages that have been reported, the matter of price looms large. Some claims of power shortages, when analyzed, have proved to be merely an unwillingness to pay the rate necessary to purchase a needed power supply, which, in physical amounts, was entirely ample.

The power shortages estimated by public bodies have generally been at a time in the future so far away, that they have been eliminated by new construction before the time arrived for their expected occurrence.

In addition to the unprecedented increases of 7½ million kw in generating capacity to be added in 1941 and 1942, a great basic element of strength in the electric power situation is the ample reserves of generating capacity that have been built up over past years. The excess of 30 per cent over the annual peak loads, represented by the installed capacity of generating equipment in this country, is required partly by the insufficiency of stream flow at times to operate all hydro units at full capacity and partly by the maintenance requirements of steam units; but there is still left over a generating margin averaging perhaps 10 to 15 per cent to be drawn upon as needed. Another unused reserve, in the case of steam generating stations, is the ability, in emergency, to exceed rated capacities by a margin of 10 to 15 per cent during a peak of moderate duration, and in the case of hydro generators, a still larger effective capacity above nameplate ratings. A still further resource, that has so far hardly been tapped in the present emergency, is the huge increase in energy that would be available from continuous operation of existing plant throughout the 24 hours of the day for seven days a week. That is the schedule on which our own industry operates; others could approach closely to this performance. This alone could add 15 to 20 per cent to the annual power output of all electric generators, sufficient to carry a further increase in industrial production of nearly 20 per cent.

Until all of the considerations above recited have been applied to a given situation, an allegation of power shortage is unwarranted; and when they have been applied, I believe the power situation will be found to have been adequately provided for.

Cooperation in Defense Effort

The members of our company organizations have been most usefully active, in cooperating in the defense efforts of the government, by working with the Federal Power Commission and other governmental bodies in securing information from customers and by facilitating

extension of service to defense agencies. For nearly a year now your president has been on leave of absence to serve in Washington with the Defense Commission and later with the Office of Production Management. I know of no way in which he could have been of greater help to the member companies and to the government. It is gratifying, as showing the true public service nature of our business, to be able to report (as I can most sincerely) that no concern or interest of the electric utilities has been at variance with the interest of the defense program.

The Contribution of the Manufacturers

While we may view with some satisfaction the totals of new generating capacity scheduled for completion this year and next—50 per cent greater than in any past comparative period—we must realize that our orders for generating equipment would be but scraps of paper, if they were not backed up by a manufacturing industry able to deliver this greatly increased output of equipment. When, in addition to the unprecedented needs of the electric power industry, we learn that these same electrical manufacturers are being called upon to fabricate, at the same time, an equally large kilowatt capacity in propulsion turbines for our navy, we must realize that relatively their burdens are much heavier than our own.

It is a pleasure and a satisfaction to express to our great allies the pride we feel in their current achievements, both for the public service and for the national defense. As Mr. Bernard Baruch remarked recently: when Germany made war into a completely mechanized process, she was playing right down our alley as a nation. No part of our vast industrial system has lived up more fully to our American genius for production than have our great electrical manufacturers.

The Holding Companies

It is now nearing six years since the Public Utility Holding Company Act became a law. During that period the meticulous and far-reaching regulation of such companies, therein provided, has been worked out and exercised in great detail. Since such regulation prohibited all of the abuses which led to the enactment of the law, the holding companies may be supposed by now to have eliminated them.

During the past year the S.E.C. has been active with proceedings under Section 11 of the Act against these companies. This "integration" (or "disintegration") is being applied, not only on the basis of the Act (whereby disintegration has nothing whatever to do with the degree to which any company is, or is not, guilty of any of the abuses against which the Act is directed) but in addition, judged by certain tentative conclusions, is being made more complete by the apparent reading into the Act, words which it does not contain.

The history of the development of the utility industry clearly shows that the holding companies have been of enormous benefit to the people, in the extension of electric service to millions of homes that otherwise would not have it, in the lowering of rates and improvement of service and in the financing of the huge developments that made all these benefits possible. One would suppose that, after such abuses as might have risen in this great development process had by law been eliminated from the holding companies, they would be allowed to continue to perform their useful functions in the public service.

A number of holding companies are preparing to appeal to the Courts in the belief that their constitutional rights are being invaded by dissolution.

The relative dearth of holding company financing since the depression of 1929 has not been confined to such companies, but is merely symptomatic of the general low estate of equities, during that period, in all lines of business. Common stocks, representing as they do essentially venture capital, are naturally depressed by government action.

Based on net earnings for the first quarter of this year, the common stocks of a representative group of ten of our greatest industrial concerns sold recently, on an average basis, to yield about 12 per cent on such earnings. At the same time, the average earnings yield on market price for the common stocks of ten outstanding electric operating utilities was 8.8 per cent. Yet for ten principal utility holding companies the earnings yield on common stock averaged 17.5 per cent.

None of these figures in view of the low cost of money these days could be said to show investor confidence in the prospects of American business; and the great disparity between operating and holding companies in the utility field shows all too clearly the effect of the threatened disintegration on the latter. All values in business are the result of investment plus that delicate plant, confidence; with confidence gone, investment quickly shrinks to the vanishing point.

With the huge scope and essentially industrial nature of our defense effort, the restoration of confidence in the soundness of its business enterprise would seem to be of intimate concern to our people and their government.

The Year's Operations

For the 12 months ended May 30th, generation, sales and revenues from electrical operations reached new all-time high records.

Generation by all agencies contributing to the public supply totaled 152,900,000,000 kwhr, an increase of 11.8 per cent over the 136,800,000,000 reported for the previous twelve months.

Revenues from consumers totaled $2,500,000,000, an increase of 6.2 per cent over the $2,355,000,000 of the previous twelve months.

The trend of the previous year's income statement was substantially unchanged. Due to the heavier industrial load and to some spread of second and third shift operations in factories (the use factor is the highest on record), the electrical utilities have been able to operate at somewhat better load factors and operating expenses have so far increased at a smaller rate than have gross revenues. On the other hand drastically increased taxation has absorbed all the rest of the gain in revenues, so that the position of the investor—taken as a whole—has shown further deterioration. Operating income for the 12 months ended May 30 was the same as the operating income for the previous twelve months. Net income, available for stockholders and surplus, has increased by about 2 per cent, but this has been due entirely to refunding operations, whereby the return to the bondholders has been reduced.

While return on investment has remained substantially unchanged, the stockholders of the operating companies have been forced to forego an increasing volume of dividends, because this money has had to be used to finance new construction. An analysis of the balance sheets of the operating companies from 1937 to 1939 shows certain trends which persist with even greater force at the present time.

During the two years, 1938 and 1939, there was a total of about $600,000,000 of new construction by electric operating companies. Half of this was financed

from depreciation reserves reinvested in plant; $100,000,000 of new capital was raised and $150,000,000 consisted of profits from operation, which should have gone to the common stockholders and which averaged $1.75 annually on each $100 of book value of common stock.

For the year 1940, with a construction budget of $500,000,000 the current sources of construction funds from depreciation accruals and undistributed net earnings failed by $170,000,000 to defray constructions costs. In the current year, with a budget for construction of $100,000,000 more than the previous year, approximately $250,000,000 will have to be raised by new financing.

With the high cost of equity money on the one hand and, on the other hand, the objection to selling additional senior securities without corresponding equity coverage, the problem of financing the extensions required by the national defense has become a most perplexing one. In recent years the market conditions I have mentioned have produced the necessity of maintaining sound ratios between funded debt and total investment, largely through medium-term bank borrowing, rather than through the sale of stocks, as was the practice in former years. This means of course that the equity coverage thus obtained comes eventually from earnings. (A decade ago commercial bank loans at the rates, and for the periods, now prevalent, would have been unthinkable.)

It is worth recording that the latest available combined utility balance sheet of the country shows a ratio of 51.8 to 48.2 between bonds and stocks—a relationship the same as 12 years before. The maintenance of this conservative debt ratio, difficult though it may be, is a source of underlying strength to the utilities, which should bring renewed public confidence in their securities when normal financial conditions return.

Sales Activities

In the field of lighting, the outstanding development of the year has been the growth in use of fluorescent sources for illumination. This has taken its place with other great industry products of the last decade, the total of such lights sold having mounted to 7,100,000 in 1940, and 19,000,000 estimated for 1941. Our lighting committees have been active in the study of the scientific facts surrounding this form of lighting, in order that the accurate knowledge thus obtained may be a guide and encouragement to sales progress in this field.

The gains effected during the year in liberalizing the National Electric Code have been followed up through the Institute with field contacts, looking to the promotion of adequate wiring through the use of the new wiring materials and methods of application. The study and work of the committees involved have produced a complete set of promotional items, which should enable our customers to benefit substantially from the Code revisions, both in cost of installation and improved service.

Rural electrification has been shown in recent years to be essentially an educational problem. A special committee has given this subject attention and a national conference has been held to promote a better understanding on the part of the farmer as to how he can improve his position by the use of electrical equipment. A special publication is issued for informing utilities on this subject.

We have continued to enjoy the generous cooperation of the manufacturers in the carrying on of the Modern Kitchen Bureau, the Electric Water Systems Council, the Better Light-Better Sight Bureau, and the Commercial Electric Cooking Council.

The unprecedented demands on our systems for the power required to carry the loads of defense industries, has raised the question of the propriety of continuing active sales effort during the present emergency. Study of the situation leads to the conclusion that such activity should continue.

Nothing has been brought out more clearly, from the experience of both the present conflict and the World War of a generation ago, than the paramount importance of the Home Front, not for sentimental reasons only but as a very practical measure of defense. In this field electricity plays an important part. Agreeable conditions in the home mean better and more efficient work in the munitions factories. Labor saving in the home means that much more energy for defense production, where the worker has household tasks to perform after working hours. The expanding payrolls of the defense activity have produced so far this year increases of 51 per cent in refrigerator sales and 42 per cent in range sales over the previous year. These represent a broad need which it is our duty to develop in the public interest.

In the power requirements of industry our power salesmen have been most useful in helping our customers with advice and information.

Sales activity in the commercial and residential fields not only helps with public morale but helps to keep rates down. The fact that average energy rates in the home continue to drop in the face of rises on all sides in the cost of other commodities, should be a great satisfaction to the Office of Price Administration and Civilian Supply. While rising costs may make it impossible to hold to the past trend of reduction, sales effort is the best remedy for the difficulty. We must not forget that, taking 1913 as 100, the cost of living at the end of 1940 stood at 144 while residence electric rates were only 45.

Finally, keeping the utilities as solvent as possible is a strong defense desideratum, because impoverished utilities would mean inefficient service. This fundamental need of our business is as important for the emergency as during the trying post-war depression that is bound to follow the present stupendous public expenditure.

Public Power Elections

The public continues to show a preference for private enterprise. So far this year, 23 municipalities and local districts have voted on the question of public ownership of electric utilities. 14 of these have voted against public ownership and 9 voted for it. This is not the whole story, as the 14 that voted against public ownership have a population of 324,577 as compared with the 12,313 population of the 9 that voted for public ownership. Last year, a total of 99 communities with a population of 1,472,871 voted on the question. 28 with a population of 257,818 voted for public ownership and 71 with a population of 1,215,053 voted against it. Judged both from the total number of elections and the population of the communities, it is evident that the trend is definitely away from public ownership. This is strikingly illustrated when we consider that the population of the communities voting for public ownership, in the first five months of this year, represents only 3.6 per cent of the population of all communities voting on the question.

Institute Operations

The Institute has been successful during the past year in fulfilling its function as a forum for the exchange of information, as a statistical and fact-finding body, in participating in various cooperative national sales programs, and

APPENDIX

Results of Municipal Plant and Franchise Elections 1933-1941

Number of Elections Held

	For M.O.		*Against M.O.*	*Total*
1933	78	70.3%	33	111
1934	58	55.3%	47	105
1935	65	59.1%	45	110
1936	49	38.6%	78	127
1937	42	43.8%	54	96
1938	110	50.5%	108	218
1939	35	46.7%	40	75
1940	28	26.2%	71	99
June 1, 1941	9	39.1%	14	23

Results Weighted by Population

	For M.O.		*Against M.O.*	*Total*
1933	4,595,096	70.5%	1,924,509	6,519,605
1934	3,904,134	63.3%	2,251,362	6,155,496
1935	718,548	54.9%	591,234	1,309,782
1936	1,572,697	27.4%	4,162,188	5,734,885
1937	333,952	11.4%	2,605,458	2,939,410
1938	538,754	37.2%	907,717	1,446,471
1939	120,860	11.7%	910,341	1,031,201
1940	257,818	17.5%	1,215,053	1,472,871
June 1, 1941	12,313	3.6%	324,577	346,890

in representing the industry in national proceedings such as those of standardizing committees and code-making bodies. The attendance at committee meetings, the unprecedented size of the three annual conferences on Sales, Accounting, and Engineering, and the demand for their reports and proceedings, attest to the real value of such organization. In view of all the changes and developments of the present times, vitally affecting the future of our industry, it is obviously important that our engineering, sales, accounting, rate-making, and other operations be kept under close study, to take full and immediate advantage of every possible improvement which will safeguard the immediate (and future) well being of our companies. In times of great stress, only the informed, capable, efficient and progressive enterprises give the best account of themselves. In the past, technical advances time and again have contributed greatly toward holding our financial position. In these difficult times, this is again a resource which must be exploited to the limit of our capabilities.

I have spoken already of our national cooperative sales program. The importance of accounting, and the value of the work of our accounting committees, has been brought sharply to our attention in recent years. As an industry, we are faced with the imperative need of keeping down operating costs in the face of staggering tax increases and, at the same time, of collecting, compiling and furnishing a great volume of detailed information concerning all the ramifications of our operations. To accomplish both these purposes throws an extraordinary demand on our accounting forces; and there never was a time when we needed more to consult each other to bring to bear our combined thinking and experience on these difficult tasks.

Engineering always has been, and must continue to be, the foundation of the quality, dependability and economy of our service. The past year has been a notable one for our engineering forces, in studying the development of defense loads and in planning for the necessary extension and coordination of facilities to care for them. In this work the meetings of our Engineering Committees have played an important part, in making available to all the contribution of each participant. Even in the last five years, the per cent of Lost and Unaccounted for Energy has been so reduced that in 1940 we had over 4,000,000,000 kwhr to sell that, under 1935 conditions, we should not have had.

What has been said about these larger departments of our companies applies with similar force to many of the other departments. This is no time to slacken in our efforts to advance the art of generating, distributing and utilizing electricity.

Relations with the Securities & Exchange Commission

Last winter the Institute was requested by the S.E.C. to file an annual report of earnings and expenses and to advise the Commission as to the nature of its activities. The request for this report was based on the claim that the Institute was, under the definitions in the Holding Company Act, engaged principally in the business of furnishing service to utility companies and was therefore a service company. Our counsel confirmed this finding; and the report was filed with the Commission in March. Some members of the Institute, not subject to regulation by the S.E.C. became apprehensive that, as a result of this ruling and filing, they would, solely through their membership in the Institute, become subject to S.E.C. regulation; and a few members, including our largest one, resigned from the Institute.

I took the matter up with the Commission, explaining that if the resignation movement continued it bid fair so to weaken the Institute, as greatly to curtail its usefulness to the industry and to the public, if indeed it could continue to function at all. In view of the long and effective record of the Institute, and its predecessor, in the maintenance and improvement of the electric service rendered to the people, I could only view its dissolution as a distinct public loss.

With this viewpoint the Commission agreed; and while it is contrary to its policy to issue advisory opinions, it did arrange for a letter from the head of its Public Utility Division, copies of which were sent to the members of the Institute. In substance the letter agreed with the opinion of our counsel—that membership in the Institute would not affect the status of any member as to the regulation by the S.E.C. but that if any attempt were made to assert such regulatory power on the basis of such membership, the situation could, after such determination, be completely cleared by resignation.

In my opinion this new development should not in any way adversely affect the Institute. It does collect dues from its public utility members, which dues represent part of their operating expenses; and it is entirely fitting and proper that a public body should check up, to see that the services the members receive from the Institute are worth what they cost. I am satisfied that their value can be demonstrated to any fair tribunal.

The dues were reduced this year from 1/25 down to 1/35 of 1 per cent of the gross earnings; and the cost per member could be reduced still further if more nearly 100 per cent of the industry

(*Continued on page* 246)

Industry and National Defense

By William P. Witherow

Chairman, Defense Committee, National Association of Manufacturers and President, Blaw-Knox Company, Pittsburgh, Pa.

Address before the First General Session of the Ninth Annual Convention of the Edison Electric Institute, Buffalo, N. Y., June 3, 1941.

IT has been my privilege to have been closely associated with the industrial effort of this country, particularly in the last seven or eight years, during which period many changes have occurred in its economic structure. As a member of the Board of the National Recovery Administration, where I had the opportunity of sitting together with Richberg, Hillman, Murray, Edison, Henderson, Nelson and others, I was able to participate in discussions of the many intricate problems pertaining to our industrial framework, and to view at first hand the personalities then engaged in the task of trying to solve an ever increasing number of new and trying economic problems.

When the decision was reached for all-out defense, I was again afforded the opportunity, through my association as Chairman of the Defense Committee of the National Association of Manufacturers, together with the participation of my own company in many parts of this gigantic effort, to re-examine and explore the industrial picture of the United States.

And so in my mind today I carry two pictures of American industry operating in two distinct emergency periods. During each of these I have enjoyed some rather close contact with the great utilities industry. I can well recall, during the NRA days, the many occasions on which the Utility Code was brought before us. As you know, a Code was never formulated, but the processes of hearings and discussions are very clear in my memory and I believe that of all the branches of industry, the record of the utilities, as disclosed in Washington during those days, was of outstanding significance. Important and irrefutable facts were disclosed at that time, particularly with regard to the public acceptance of the services which you offer.

Anyone who has traveled abroad and utilized the services of foreign utilities can well judge the relative merit of the great utility institutions of our own country. And anyone who uses such facilities as the telephone, the electric light, the radio, the refrigerator, and anyone who benefits by the efficient power that drives the motors of industry, can well realize what a great contribution you have made to the building of American progress, prosperity, happiness, and a standard of living unparalleled in any civilization heretofore conceived.

MR. WITHEROW

Since the days of NRA, your industry has continued its contributions under difficulties. Some one has said that our country, during these past several years, has been in the throes of indigestion. So much has been forced upon industry generally that the economic digestive tract has had difficulty in handling it. The multitudinous changes, diverting and divesting managerial powers, all concentrated within a few years time, have made industry gulp and have caused strain in its accommodation to the new diet.

While your industry, with the rest, has been confronted with this overloading, you at least, by virtue of advanced doses and a longer training period for the augmented diet, have had more time to adapt and accustom yourselves to these changes.

But industry has shown great capacity to withstand this excess load of intervention and over-dosage of change. It has survived kaleidoscopic alterations in its methods and rules. It has kept right on functioning, improving production methods, advancing its research, its technology, its personnel training, its public relations and employee relations, until today it stands ready to fulfill the greatest responsibility of the ages. It stands prepared to answer the call for production and more production; ready to exert its might for defense.

Yes, industry has shown great intestinal fortitude during a trying period. The job that lies ahead will require further dependence on the use of every ounce of energy, courage and sacrifice which management and worker alike can give. And first of all it will require a realization and a deep conviction that this defense job is all important, and a resolution that this new emergency *shall* be met.

More than 150 years ago, Burke said: "When bad men combine, the good must associate; else they will fall, one by one, an unpitied sacrifice in a contemptible struggle." That proverbial sentence sounds like a prophecy when we think of the present graveyard of nations. International gangsterism has set the world aflame. England, almost alone, stands to defend the rights of free men. We, as a nation, have responded to the call for help. What American would stand idly by and permit the house next door to be consumed in flames? Whether we are members of any particular organization for, or against, participation in this great effort, it seems to me that we must defend the principles upon which this country was founded and upon which we have our very being.

This is not a war to conquer nations . . . it is far deeper than that. It is a supreme effort on the part of men who, through frustration or hate, have decided to implant a barbarous and savage form of society upon the entire world. Our American heritage impels us to say that we will not permit this to happen.

There has been some loose thinking on this subject in recent months. There have been some expressions that, regardless of the outcome of the war, we are in for irreparable damage and cannot survive. It seems to me that the development of this type of defeatist attitude would cause the only possible failure in the vast program ahead.

The President said the other night: "There are some timid ones among us who say that we must preserve peace at any price—lest we lose our liberties forever. To them I say: 'Never in the history of the world has a nation lost its democracy by a successful struggle to defend its democracy. We must not be defeated by the fear of the very danger which we are preparing to resist. Our freedom has shown its ability to survive war, but it would never survive surrender. The only thing we have to fear is *fear* itself'."

Of course, we must concede that the job ahead will require sacrifice on the part of every individual in our country. It is true that borrowing by our government will become greater and greater; that our national debt will become larger and larger; that taxation will tend to reduce our individual financial stability. It is true also that certain changes in our society, many of which have already occurred, will have serious impact on our daily lives. But our great country, founded on courage and sacrifice, has never permitted vast odds nor lowering skies to dim its strength or obscure its purpose. I wonder if Washington at Valley Forge . . . or Abraham Lincoln at Gettysburg . . . or Pershing at Chateau-Thierry . . . or Edison, Marconi and Bell in their laboratories . . . I wonder if these men gave too much thought to anything other than the immediate task ahead. So today, as we put our whole hearts into the job of defending our freedom, we must face the facts courageously and by so doing breed courage in ourselves; we must cast aside "the jitters." Surely we can and will demonstrate the same daring and courage as the Britons, the Greeks, the Australians, the New Zealanders, the Serbs and the Chinese.

We are all familiar with this verse from Matthew: "On this rock I will build my Church, and the gates of Hell shall not prevail against it." Our nation was built upon the precepts of the Church; religious freedom has been provided by our Bill of Rights. Let us renew our faith in the Almighty; let us disregard the whisperings and fears of the weaker hearts; let us staunchly proceed in our tasks. Let worry and doubt disappear. This country will always be great—it stands today as the bulwark of the free peoples of the world; it cannot be destroyed, save by the terror of the human heart. The people of America cannot and will not permit this to happen.

As is well known, this war is almost wholly a mechanized war—therefore, a war which is fought first of all on the production line. In our defense production effort, the Defense Committee of the National Association of Manufacturers has had an opportunity to act as liaison agent between government and industry. We have endeavored to interpret the manifold instructions and orders and acts emanating from Washington. We have been in constant contact with the officers of OPM, the Army, the Navy, and other departments.

On a recent visit to Washington, it was my privilege to interview the top officials of these various organizations. It was our desire to ascertain how industry was functioning in the great cooperative effort to defend America. I was pleased to find that, with few exceptions, industry has taken the task seriously to heart, has cooperated in every respect with the extraordinary demands of the government, and has girded itself for vast production.

We hear a great deal of criticism of individual effort in government and industry in connection with the defense program. My close knowledge of and experience with the men to whom this job has been entrusted prompts me to give the lie to these accusations. Nowhere, and at no time, has the United States been blessed with better leadership than is found in the names of Knudsen, Hillman, Stettinius, Biggers, Nelson, Batt, Glancy, and others. These gentlemen have only one dominating interest—and that is patriotic devotion to their country. Officers of both Army and Navy have shown astonishing skill, capacity and ability in formulating and advancing the defense program. While the correlation of all governmental groups still leaves some room for improvement, generally speaking, the cooperation of all departments has been remarkably fine. I appeal to industry to give them full support and full cooperation, and to follow their leadership even though their rulings may seem at times detrimental to individual interests.

The list of accomplishments of our defense effort is well known to almost everybody here. While there have been disappointments and bottlenecks and discouragements, I can unhesitatingly say that the big job of production—far surpassing anything ever attempted before, including the 1917 effort—this big job is being performed. It is true that it takes time to build up line production, which requires vast engineering, tooling and jigging effort. Our experience with the British in many cases has given us opportunities to do very quickly the preliminary work in plant construction and engineering and the other items of work which must be performed prior to the assembly of the machine. I feel that the spokesmen of the government have been very modest in their statements of progress.

The total defense program commitments to date, including appropriations, authorizations and British pledges, amount to forty-four billion, seven hundred million dollars ($44,700,000,000), and the total contracts let to date have been eighteen billion, nine hundred million ($18,900,000,000). New contracts of large volume are proceeding daily. Tank production has been increased 600 per cent and this total will be quadrupled; powder output has risen 100 per cent, and it must be trebled again; small arms ammunition is up 1200 per cent; rifle output is up 360 per cent; 30-caliber machine guns are up 300 per cent, 50-caliber 500 per cent.

In May, more than 1500 military airplanes were produced. This compares to production in May a year ago of 400 a month. In August, it is expected that we shall reach 2000 military aircraft a month. I believe these figures to be conservative and I venture the opinion that before the end of 1941, there will be 3000 airplanes per month rolling from the production lines.

I am familiar with many of the projects ahead. I believe that by the end of this year there will be such a whirl of activity in the production lines of our country that all records of all kinds —of any country—at any time—will be exceeded, and that American industry will show its people results which they know it is capable of accomplishing.

In spite of some statements to the contrary, industry, through its manifold organizations, has been cooperating with the governmental officials in surveying all machine facilities of this country so that all companies, both large and small,

may be included in the program. A survey made by the NAM has already been presented to the Director of the OPM, and in his own words he has acknowledged its great value in finding widespread existing facilities for manufacturing the needed defense materials.

While it is true that the large companies were given the initial orders, it is only natural that goverment would turn first to the concerns who are equipped financially and mechanically to get a running start in the production program. In my contacts, I have found everywhere a driving effort to widen the base of defense contracts to small contractors throughout the country. The sub-contracting idea is prominent in the minds of all government officials and in the industrial world today. It is quite unfair to any group to represent the policy to be otherwise.

With special reference to the utility industry, I know that you have been besieged with surveys by government authorities and others for data covering your ability to perform in this great crisis. Other industries, such as steel, have been thoroughly canvassed. The first Dunn steel report stated that there were ten million tons excess capacity. His report a few days ago shows the tonnage to be 1,400,000 tons short for 1941 in fulfilling defense, British, and normal civilian requirements. This discrepancy is an indication of how additional loads, due to constantly changing conditions, will affect any kind of proper planning and estimates. Government requirements for defense grow from day to day, and many of the production programs change overnight. I have seen evidence in our own company, where certain important items have been doubled and trebled inside of a week's time. For this reason, it is most difficult to properly appraise the requirements of any industry for this all-out effort. However, steel capacity seems more than ample for the defense program.

The utility industry has made many useful estimates and surveys. It is interesting to note that a report compiled by the National Association of Manufacturers, using as its base the reports of the Federal Power Commission and your own Edison Electric Institute, seems to lead to five general conclusions:

1. For the country as a whole the power supply, as augmented by new construction scheduled for completion in 1941, 1942, and 1943, should prove ample for all demands upon it.

2. In a few areas there is some danger of shortage. These situations are being corrected in most cases, but there are local utilities where some strain is likely to be placed on reserves.

3. The factor of obsolescence and inadequate excess capacity of factory-owned power plants will bring increasing dependence of industry on power purchased from central stations as industrial activity advances.

4. There is need for further progress in the interconnection of system and the closing of the four principal gaps in the high voltage transmission system.

5. There are two potential limiting factors from outside the utility industry: (1) Limited facilities for the manufacture of heavy electrical equipment and (2) limited facilities for the transportation of fuel. It is only fair to say that as yet there is no indication of difficulty from either source caused by the demands of the defense program.

It seems like quite a paradox that the most recent power shortage seems to have been developed in the TVA area of the government hydro-electric development. The conclusions reached by the survey seem to indicate that the strong position the utilities have taken to defend their rights to conduct their properties, subject to governmental supervisions, in the great system of private enterprise is being justified more fully and effectively to the American public. It sometimes requires a crisis to evaluate prôperly.

My thoughts return to the flood of 1936 in Pittsburgh and the Ohio Valley. I had occasion to be closely associated with flood relief and my recollection is very vivid as to the great sacrifice and magnificent performance which the telephone, gas and power companies displayed in accomplishing seemingly impossible tasks to relieve the people of destitution and suffering. In such a manner, the utilities in the great crisis which faces our country and the world today, have demonstrated by their courage in making large investments in plant extensions and improvements that they will furnish the sinews and life-blood of industrial operation at this critical hour. Moreover, I believe that the traditionally American principle of free enterprise will help to accomplish this job.

We might ask ourselves:

1. What has industry done? It has furnished the government with production and business experience needed to administer and oversee the production of this great military machine. Industry has re-forged its plowshares into swords, its pruning hooks into spears. A maker of sewing machines now makes pistols. A maker of lingerie weaves mosquito netting. A linoleum factory makes shells. Oil plants make rubber, and rubber factories make gas masks. A typewriter factory turns out machine guns. A tobacco machinery plant manufactures Diesel engines. Auto makers turn to tank production. A lipstick maker produces shell cases. A lawn mower manufacturer turns out fuses. A carpet manufacturer fabricates machine tool parts. A jobbing foundry makes armor plate.

This, it seems, is indicative of the will of American industry through private enterprise to carry out its true American function and to prove its patriotic effort and devotion to the cause which this defense effort involves.

2. What must industry do? It must not be satisfied with prior accomplishments. It must subordinate civilian manufacturing needs to the great productive effort for defense. It must remain steadfast in the faith to perform the impossible. The greatest safeguard to a perpetuation of the system under which business has been conducted these many years of American development rests in the ability of industry to perform. This, I am sure, she will do.

3. What of the cost? Assuming serious dislocations to the financial and economic structure of our country, always prevalent in any national emergency, my conviction is still that she should and will hold steadfast to the task in hand through our present institutions and thus justify their maintenance.

Worker and employer stand together in this gigantic struggle for production. All are Americans. All groups stand for patriotic devotion to country. Greater understanding, coordinated effort and sacrifice for the common cause will surely follow. Individual advantage in any group cannot blind the eyes to sacred dedication of everyone's effort to fight the battle of industry in the trying times ahead. Preservation of our heritage of freedom and democracy touches deeply the hearts of all citizens of our country. The protection of the rights of industry and labor go hand in hand.

I can recall so well a situation in 1936, when I was a member of the United States delegation to the International Labor Organization at Geneva. This international convention represented all the countries of the world and was assembled to discuss possibilities for better understanding between employer and labor. The convention was founded upon equal representation from government, industry and labor, and this tri-partite basis was carried out by practically all of the 48 countries represented.

However, it was interesting to note

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National Defense Comes First

By W. L. Batt

Deputy Director of Production, Office of Production Management

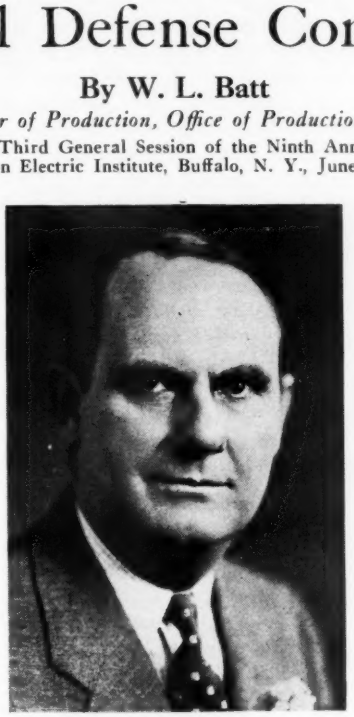
An address before the Third General Session of the Ninth Annual Convention of the Edison Electric Institute, Buffalo, N. Y., June 4th

I THINK the real reason I am here this morning is because Bill Kellogg asked me to come, and as busy as he was, and as hard as it was to get away during the 12 months that we have been together in Washington, he has not failed me a single time that I have asked him to do something, and it seemed completely ungrateful for me to say that I couldn't come to Buffalo and address this convention. So I said I would be very glad to come, provided I could talk informally to you and to some extent off the record, and merely discuss the whole defense picture as I see it in light of the conviction which is very deeply imbedded in my mind that we, the American people, have to wake up to the seriousness of the job with which we are confronted.

Now the problem of presenting that point of view becomes very much simpler after the President's address to the Nation—indeed, to the world—about a week ago, but because of that, it becomes difficult for any one to say anything which shall be compared in effectiveness with what the President said. In any event, there is no excuse for any of us today failing to understand the gravity of the conditions with which we have to contend.

Let me run back over the situation for the last year and see if I can paint a broad picture. Beginning with last June, we have been engaged in a great effort. Many of us knew it was a great effort, and of course all of us said it was, but in my judgment the people of the country as a whole have failed, until very recently, to understand that this situation was as serious as it was and that the possible effects on the economy of the country were grave. I don't think we were behaving, as a people, as if we really understood the urgency of the job which had to be done. That is not to say that we haven't made real progress, because we have progressed, but many of us have been naive about the size and cost of the undertaking.

We have been, most of us, making the same mistake. We have assumed that because America was the greatest manufacturing nation in the world, there wasn't anything we couldn't do; that we could take care of defense on Friday



MR. BATT

afternoons and Saturdays and Sundays. We could take it in our stride. We could have our normal living, and carry on the necessary defense effort at the same time. Everybody made that mistake: industry is not particularly to blame. But I think I am obliged to say that industry has been—what shall I say—more enthusiastic in the concept of its ability to handle the job than realistic about its limitations. We thought nothing was too big for us to do, and as a result, we find ourselves rather completely surprised with the variety of bottlenecks (much as I dislike that word, but I have no other better) that are developing around us day by day. But certainly, whatever this point of view or the approach of the last 12 months may have been, today we realize that we have got a problem on our hands. We have got a problem that certainly involves much harder work than we have any conception of, much longer hours, more sacrifice.

Let us see, for example, what is happening in the raw materials field. We have rested rather complacently, I think, in the knowledge that we were the greatest consumers of raw materials in the world, without pausing to consider that a substantial part of these critical and strategic materials came from half way around the world, and might have to be brought in at a time when shipping was otherwise seriously impeded. We find ourselves relying on some far part of the world for manganese, chrome, tungsten, tin, rubber and other materials that I can name, and it is a little surprising to us that now, when we are not at war—when we are carrying on the normal pursuits of peace—that we should have to be rationed on things of which we thought we had a great abundance. We are rationed on nickel, we are rationed on aluminum. We are rationed on magnesium. In some areas of steel production, we are finding ourselves short, and so on with zinc and copper; and I am afraid there will be other materials added to that list before too much time has gone by.

Now the total problem was a sufficiently difficult one, even if the load had remained what it was up until two or three months ago, but with the passage of the Lend-Lease Bill, we took on a new responsibility. We said we would be the arsenal of democracy, that we would produce the arms and the other materials that the democracies of the world needed and weren't able to produce for themselves. And it is there, as I see it, that the already tremendous job really began to develop in size, because the wants of nations at war are almost insatiable, and the wants and the needs of England and China and other democracies are so great as to call for a production capacity in the United States far larger than we have had ever imagined.

As we look at this obligation, we see that how successfully it is performed is of vital consequence to our democracy, to management, to capital and to labor, because having promised the rest of the world that we would be their source of supply for everything they wanted, our failure to come through would be inexcusable on the part of a great free people. But to give them what they want will demand much more of us than has ever been demanded of us before—I think much more than has ever been demanded of any democratic economy at any time—and if we are to keep that promise, we are going to have to work harder and faster and longer and give up more things than we have ever had to give up in the past. We are certainly

committed to pooling the resources of this country to do the job—and I have full confidence that we will do it, but I regret that we have been so slow in getting under way, because those days which have been lost we can never recover.

Industry started out on this defense job pretty substantially on the theory that it could have new machinery with which to operate. Our ordnance plants, and other plants engaged in the production of defense materials specified the machinery that they wanted as of the latest design and had every reason to expect that they would get it, but our machine tool capacity has not turned out to be adequate for the job. When I remind you that the machine tool capacity of the country from 1935 to 1939 averaged about one hundred million dollars a year, in 1939 doubled to two hundred million dollars, in 1940 again to four hundred million dollars, and in 1941 jumped to about seven hundred fifty million, you certainly will agree with me that that is a tremendous increase for any industry to sustain—and it is, but still we have not enough machine tools, and today there are no machine tools for normal civilian requirements and not nearly enough for the needs of defense.

One way of meeting that shortage of machine tools is to increase the amount of subcontracting. That idea we have not stomached very well. Very few people like subcontracting. When I talk to the people in my organization in Philadelphia about subcontracting, they say, "Oh, it is never done right. The stuff we receive is expensive or it is unsatisfactory. We have to reject this or that per cent of it. We would rather make it here." But subcontracting can be done satisfactorily, and some of the defense contracts of the country requiring the most intricate machinery and equipment are being effectively subcontracted, because the companies have set out to do it, and have found ways of making it work.

Subcontracting is one of the ways in which we will have to try to tackle the machine tool problem, but we are going to have to do much more of it in the future than we have in the past, because if you can find a machine available in private industry to do a defense job, it is obvious that you can get that defense job out quicker using that machine, than if you wait for the production of a new one. And I think every man in this room will agree with me that if a defense job needs to be done, and the machines are in existence in private industry to do that job, that those machines ought to be made available in one way or another for the doing of that defense job today. Now that is a large commitment, gentlemen, and I wish I could have the opportunity of knowing how each man in this room feels about it. Certainly, if you accept such a philosophy you will recognize that there will be many interruptions in civilian production. If you don't accept it, then you will have to say, as a necessary corollary that defense is not going to come first, but if you are as concerned with the gravity of the situation in which the United States finds itself as I am, you will insist that nothing ought to come ahead of defense. You will agree that wherever machine tools are available, with the least possible dislocation to civilian requirements, those machines ought to be turned to defense work.

Now not much of this has been done. Certainly we in the OPM, and the services, have been hesitant. I know of no single case where an industry has been approached with the request for the loan of machine tools that it might be able to spare from its plant, on the ground that they were seriously needed for defense and that new machines weren't available. But I think those requests are going to be made, and if they come to you, I hope you will share the determination which I believe is general, that whatever the sacrifice, we in industry are prepared to make it once the need is real.

Many of us are worried, quite understandably, about the problem of approaching the emergency situation which will be created by this defense program. We have observed the huge expansion of the machine tool industry, as an example; of powder plants—which are not so much a problem, because they don't enter to the same degree into normal civilian competition; and of aluminum production, with which I am particularly concerned, as well as other raw materials. We say to ourselves, "Look how we were situated from 1930 to 1937. Terrible over-production capacity in the United States; and yet when this thing is over, we are going to have an even greater production capacity than we have now." What is the answer? I don't know the answer, but I do know this: that the requirements of the defense program clearly call for a tremendous production capacity, and defense comes first. We must have that capacity, and we will simply have to make the best effort we can when the emergency is over. I for one, am not willing to let tomorrow's problem, as serious as it is, stand in our way today.

I don't think we want to make the same mistake which England made. England's handling of the war situation at the outset, had all the earmarks of a desire to run a cheap war. England said right along that she could to a substantial degree, maintain business as usual, and an editorial in the London *Economist* as late as June, 1940, pointed out to what a large extent this was being done. To a lesser degree I think it is even true today. I find, to my amazement, that England still does many things in a normal fashion which I would hardly expect her to be doing with the situation as desperate as it would seem to us to be. Now we don't want to make that mistake, because whether or not we agree with the processes by which we have gotten where we are, I think all of us have to recognize that we are walking to the verge of war—and a war which is not a simple, easy-going, odd-time occupation, but one in which we are confronting an adversary tremendously strong and devoted to just one thing; to reaching his objective at any cost to anybody.

I was very much interested in a report I saw in yesterday's paper of the examination of the engine from the most recent fighter plane brought over here for our study. The report was made, I think, by the Society of Automotive Engineers, and the conclusion was that if you think Germany's aircraft construction is inadequate or slipshod or filled with substituted and unsatisfactory materials, you are sadly mistaken. They say that from every point of view, this engine is a beautiful piece of mechanism. It is just as well finished as we could finish an engine. There are refinements on it which we do not have, and altogether, it is a job which challenges the best engineering ability that the American aircraft industry can offer.

That is what we are up against—an adversary (and I say "adversary" advisedly, because we are committed to helping England defeat the German people, and we have done things which under normal times would have provoked war very quickly), an adversary who was spending at the beginning of the war half his national income toward building a war machine and who had seventy million people then working for him. A year and a half ago, he was producing aircraft at the rate of perhaps 2000 planes a month. Our Army Chief of Staff testified before the House Military

Affairs Committee that to match his army would cost us one hundred billion dollars, and in the meantime he has added to his strength the resources of a great number of countries very considerably supplied with raw materials and industrial facilities. If we take steel as a measure of what we are up against, the Germans had a capacity of about 25 million tons a year at the outset of the war, and they have added at least 15 to 20 million more. That means a total ingot capacity of from 40 to 45 million tons a year. England has about 15 million tons capacity. If you assume that the size of this job may to some extent be measured by the capacity of one side relative to that of the other, you see therefore that we ought to be supplying England with the equivalent of 20 million tons a year one way or the other. As a matter of fact, we are supplying her only a tiny fraction of that. Last year we sent less steel to England than Germany got from the little duchy of Luxembourg—that tiny area between France and Belgium and Germany.

So I say that we have got a terrifically heavy job in front of us in enabling the resources of England, plus our aid, to outbalance the resources of our adversary. And I think that we have only just begun to assize the job realistically. We are talking now about machine tool production to the tune of seven hundred fifty million dollars a year, and I don't think that needs to be increased much, because I am satisfied that there is a very large productive capacity in the country which is not now being, but can be used for defense. But we were building 23 hundred aircraft engines a year ago, and today we are building 10 times and over that number at a cost of 30 to 50 thousand dollars apiece. In a few months, that capacity ought to be doubled, and in the course of a year or two, trebled. We had no production of tanks in this country. Now we are producing a small 10-ton tank at Berwick in fairly substantial quantities. The thousandth tank will be turned out before the year is over. But that tank is too small to do the job adequately, and accordingly construction of a so-called medium tank, weighing about 30 tons, is under way. That is a manufacturing job which is a real challenge because the tank must be able to run at any speed up to 30 or 40 miles an hour over any kind of going, and the transmission alone weighs 7600 pounds. It of course calls for machinery which to a considerable extent, we didn't have. Chrysler has built a tank arsenal, so called, that will produce nothing but this design, and such plants as Baldwin, American Locomotive, Pullman, Press Steel Car, and Lima Locomotive, will be producing smaller quantities before the end of the year.

The idea I want to leave with you as a background for these rambling remarks is that a year ago we had practically no production of materials for an army in the United States, and it takes a long time to get that production under way. The Colt people were the only manufacturers of machine guns a year ago, I think, and they were tickled to be able to make 500 machine guns a year. I suppose their business was best in the bootlegger days. Now they are being asked to make 5000 machine guns a month—and that is just one company. The ammunition requirements for the machine gun and anti-aircraft program are appalling. One 50 caliber machine gun, if you could fire it steadily for an hour (which you can't because the barrel gets too hot) would consume $5,000 worth of ammunition—just one machine gun! One 3-inch anti-aircraft battery of four barrels, firing—again hypothetically—for one hour, would burn up $130,000 worth of ammunition. You can see that this modern war is a hog for materials—unbelievably so. The job of providing housing, uniforms and the like for two million men is not a mean one, but that is the sort of thing with which we are familiar and we can take it relatively in our stride; but the job of producing shells and guns and tanks and aircraft is one for which we have had to tool up almost from the ground. As an example of the time it takes to get under way, the Budd Company spent 15 months tooling up a plant to produce their first million heavy howitzer shells. But the next million came off in two months; and you can expect with complete certainty that when all of this machinery of ours gets going it will turn out substantial production of other much needed requirements. The point is that it is inevitably a slow job, and time is of the essence so far as aid to Britain is concerned. Help to them two years from now is of unknown value; help to them today is real help.

The first bottleneck to be got around in getting that help to them is obviously shipping. There are no plans at the moment, for building another Hog Island, but sections of Hog Island are being built all over the United States to produce a stream of carrying ships which will be large enough, when added to the production of the British shipyards, to make up for the current rate of sinking. That is a big commitment, and Germany has been allowed to get a long start. We are trailing far, far behind, and the only hope we have is that Britain will hold out long enough to let the productive machinery of the United States get under way.

Now the thing that interests all of us today is the shortage of raw materials. When we first took a look at this defense picture in Washington a year ago, there was a productive capacity in the country of something less than four hundred million pounds of aluminum a year, and with increases that could readily be made, it seemed that that capacity could adequately be brought up to meet all civilian and military needs. That has not proved to be the case, because military needs have been so much greater than were anticipated. Today we have a program definitely planned, not for four hundred or six hundred million pounds of aluminum, but for a billion six hundred million, and in my judgment that program may even be enlarged later on. The result is that there is no aluminum of any consequence for civilian requirements. That is too bad, because during recent years, the natural development of commercial processes and the marketing of aluminum have put aluminum into all sorts of things. We have become accustomed to it, we need it—and now it isn't there.

You may ask, why isn't it there? My answer is that the amazing needs of a rapidly growing and uncertain war program have taken aluminum faster than it could be produced. The branches of the military services other than aircraft, which were estimated to require eight million pounds of aluminum a month, are actually taking 25 million pounds a month. Recognizing that it takes upwards of two years to produce the power for aluminum and a year to a year and a half to build and equip aluminum plants, you can see that the gap can't be filled in overnight. Civilian consumption has to take the shortage.

Nickel was something on which we could see no possible shortage when that material was reviewed, because we have a monthly capacity of about 15 million pounds of nickel, and an average monthly consumption in 1940 of only about nine million pounds. It looked as if a 60 per cent increase ought to be all that the industry and the military requirements could possibly take up, and yet the total requirements of industry and

the military today are actually in the neighborhood of 20 to 21 million pounds —which leave us with a shortage of five to six million pounds. That means a rationing of nickel, and it takes a long time to increase the supply.

We estimated last fall that there would be enough copper in the United States for all probable 1941 requirements, and that estimate was made on the advice of the leading copper producers and copper users. They admitted that it might be necessary to import, probably from Chile, let us say, one hundred to one hundred fifty thousand tons; now that figure has mounted up to the neighborhood of half a million tons, and I am not sure that is going to be enough. Where it all goes, we can't say. Yet we can find in most cases no evidence of unreasonable accumulation. I don't like to call it hoarding, because I think that word seldom applies in industry. I look upon hoarding as something which is done in order to capitalize at a higher price level. But in the process of building up production capacity our inventory requirements, of course, rapidly increases and it seems that industry is taking more of these raw materials than we possibly imagined they could. As a result these shortages are occurring, and the civilian economy will be seriously embarrassed.

People are going to have to do without a great many things on which they have been accustomed to depend. You know that automobile production has been reduced, and other production will be reduced—perhaps not in that same direct way, but by the indirect pressure of shortages of materials. Each shortage tends to be passed on down the line, aluminum being unavailable, we turn to zinc, and we create a shortage in zinc, and zinc being unavailable, we turn to copper, and create a shortage in copper, and so on. It is too bad we haven't some place to end up with complete certainty. I had hoped there would at least be ample steel, so that whatever else we had to do without we would always have steel; and yet some shortages in steel have shown themselves, particularly in the area of plates and some structural shapes. I hope that will be cured rather soon.

And now we hear about the impending shortage in oil—that prediction that we may have gasless Sundays, because of the necessity of sending to Britain 50 of our best tankers. I think that that is quite likely. It is almost a certainty that many people who are putting in oil burners will not be able to get oil regularly to heat their homes, and the suggestion has been made that as many of us as can, should turn back to coal.

A shortage in power is, I suppose, one of the last things with which you men in this room would have had any expectation of our meeting, and yet with low water plus increased defense demand in many sections of the country, such shortages apparently exist. On my visit to Canada last week, I found that they, too, were experiencing a power shortage, and were feeding power backwards, as they expressed it, to many parts of the country in a fashion that they would have considered entirely impossible a year or two ago. Now I want to throw a suggestion into this room in the hope that it will take seed some place: they told us that in Canada they were saving 150,000 kw through universal daylight saving. If we need power, isn't it reasonable for us to extend the area of daylight saving in the United States?

The huge demands for power for more and more aluminum are rather appalling to me. We are working now on the job of finding power for an additional capacity of six hundred million pounds of aluminum yearly and something in the neighborhood of two hundred million pounds additional magnesium. For each one hundred million pounds of aluminum that is produced annually, something in the neighborhood of 125,000 kw is required; so that this present program, which in my judgment is not the end of expansion, will call for an additional million kw of power. That is a shortage which is appalling, not only because of the delay which it imposes on the defense program, but also because of the possible implications of that excess power in the after-emergency.

And so I could talk for many hours, I think, on the kind of problems with which our civilian economy will be confronted during this emergency, all the time expressing the conviction that although the job is big, American industry can do it. But it can't do that job by the casual approach that it has taken toward it in the past, and it can't do it if it thinks of defense merely as an incidental part of the day's work. I think the only way we will do it is by looking on defense as our first, our vitally important activity, coming before recreation, coming before comfort, coming before civilian necessity—and then letting the other things fall in behind as best they can be made to fit. With that approach, I am satisfied that we can do our end of the job, so enormously big that few of us have any conception of its size.

I want simply to remind you that there are outstanding, today, defense commitments amounting to approximately 45 billion dollars on American industry or presently to come to American industry. I think that amount will be increased, and that we shall be spending—indeed, that we might as soon as possible spend —25 per cent of our national income for the production of defense materials, instead of one per cent or two per cent or five per cent or 10 per cent as we have so recently been spending.

When we see the job in these terms, then we can do it. Until we do see it in these terms, I think we shall have taken an inadequate approach. It is gratifying to see the problem being stated with increasing clarity by Administration leaders, so that we, in industry, at least know what is being asked of us. It is gratifying to find more and more people convinced that the job must be done, and confident that American industry can do it.

I want to add one thing more which I should have stated at the outset. Not only has your president done a splendid job—more splendid than you have any idea of, toward carrying on this defense program, but many other men in this industry have too. I simply don't happen to know them so well or to be so familiar with their contributions as I am in the case of Mr. Kellogg. I am convinced that your industry will have to make even larger contributions in the years to come, and I am certain, in so far as I have some small part in the defense program, that it can be counted upon with safety and confidence to undertake and accomplish whatever is asked of it.

Prize Awards

(*Continued from page* 283)

and Light Company, Allentown, Pa.; Claude E. Bell, Appalachian Electric Power Company, Welch, W. Va.; the Line Crew of the Charleston Division of the Appalachian Electric Power Company; Maynard Walker, Consumers Power Company, Jackson, Mich.; the Ralph Sooy Line Crew of the Philadelphia Electric Company, Philadelphia, Pa.; Julian Waltz, Public Service Electric and Gas Company, Newark; C. F. Frohne, Kansas Gas and Electric Company, Wichita, Kan.; the Amite Crew of the Louisiana Power and Light Company, New Orleans, La.; Vernon Patten, Jersey Central Power and Light Company, Asbury Park, N. J.; and the Line Construction Crew of the Alabama Power Company, Birmingham, Ala.

Financial Perils of the War

By Carl Snyder

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An address before the Fourth General Session of the Ninth Annual Convention of the Edison Electric Institute, Buffalo, N. Y., June 5, 1941

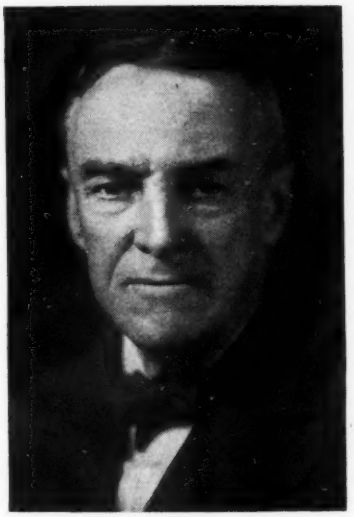
MY thesis today I draw from a very ancient and I think still well grounded doctrine, which is to the effect that you can't have your cake and eat it too. A rather strange doctrine, you will allow, these days, when it is so easy to manufacture money or credit by simple fiat of government. But the strangest part of it all is that this at least in the last 10 years or so has not brought prosperity.

A very curious outcome. Normally, a great increase of money or rather, of bank credit, which is the chief medium of exchange in the modern world, brings a marked increase in production, usually with a considerable rise of prices, and usually eventuating in what we call a "boom."

In the last 10 or 12 years—10 or 12 years will take us out of the realm of political controversy—we have had a huge increase in the volume of this bank credit, accompanied by unprecedentedly low interest rates—banks eager to lend and few borrowers.

Normally—say in the last century—low interest rates, cheap money, plentiful credit, have infallibly presaged a marked improvement in business, often too extended to be healthy. In the last 10 years which is a fairly long time in American business affairs, we have had none of this. Interest rates have fallen to the lowest levels ever known in this country, and to about the lowest ever known in Great Britain which, in turn, means the lowest in the commercial world. A singular phenomenon. Something never witnessed before in the known history—the commercial history—of this country.

All this was the more singular, you may if you wish say the more amazing, in view of the fact that it seems probable that no 10 years in the history of this country had ever seen a greater, if as great, technical advance. With this advance, you in the electrical industry are intimately familiar. But it has not been confined to any one industry. If anything, in the field of chemistry and perhaps some others, this technical progress



MR. SNYDER

has been even more phenomenal. I suppose that the chemical industry, for example, in all its long history from the days of Paracelsus and Albertus Magnus has never seen such an astonishing advance. Almost, one might say, a piling up of chemical marvels; and extending into the widest fields of technical domain, as in the oil industry, almost creating a new petroleum chemistry and the same in the field of pharmaceutical chemistry. This country is now spending millions upon the new vitamins and hormones which have come into general usage in this decennium. In brief, every sort and kind of incentive and opportunity for another marvelous industrial advance. And it has not come. It is interesting to inquire why. The answer is very clear, and almost obvious; the lack of business confidence; monstrous doles; the piling up of taxation; the colossal expenditure of governmental funds; all in a fantastic attempt to create prosperity by government fiat. Never, it seems to me, has there been a more singular paradox of almost unbounded opportunity, almost unlimited credit, and no one to use it. Very clearly this situation exists for the first time in the history of this nation.

The explanation seems unusually clear and practically without precedent in our long and fabulous industrial history. The United States up to 1929, was the wonder of the world, the land of unlimited possibilities. And all of a sudden came a prolonged halt. Since 1929, for all practical purposes, no industrial expansion, no increase in production, or wealth, or employment. To a large extent, the utter reverse.

During at least the 150 years for which we have had detailed and trustworthy information, a steady increase averaging around 4 per cent per annum obtained for the last 50 years, and previous to that an even higher rate of around 5 per cent per annum, due, in large part, to the conversion of small enterprises to large ones, and the integration of industries into large corporate undertakings: that is, the change from hand work to mechanical and mass production. An industrial advance almost without precedent in the history of industry in any country.

The reasons for it all were very clear. It was the flowering of the new "Age of Power," the direct result of the invention of the steam engine, then of the dynamo and all the rest. Why the sudden arrest of the spirit of industrial enterprise? I shall not undertake here to analyze the technical conditions which produced this sudden change. Enough that it came, and, as I see it, the causes were very clear. Clear, I may say, to the student of these problems, but not apparently to the American people.

The collapse that followed 1929 was not unprecedented. We had had many previous visitations; in 1837, '57, '73, '93, and again for a brief pause in 1907. But in each of these instances, at least for the most part, there was a strong and vigorous rebound and a renewed era of industrial progress. But after 1929, came new factors, new conditions, and then a new political administration, highly antagonistic to this spirit of industrial enterprise and vainly endeavoring to bring about a radical change. A complete arrest of growth, accompanied inevitably by unprecedented unemploy-

ment. A highly instructive lesson in the economics of prosperity and progress. But at a simply fabulous cost!

Today, if we had pursued the same economic policies which had created the vast wealth and well being of this country we should have a national income at least half greater than in 1929. Instead, we have a dead halt. If we were to accumulate the value of the annual product at what was the normal rate in the previous half century, we should reach an astounding deficit today, over what might have been, of at least 150 billions of income. That is the cost of what we term the New Deal.

We may gain some concept of this colossal deficit if we consider that the entire industrial capital of the country, the product of 150 years of marvelous progress would not, in 1929 or now, exceed the sum mentioned—150 billions. The most astounding outcome in all the century and a half of our national existence and, for that matter, from the beginning of our industrial life. About the most astonishing phenomenon in our whole industrial history. What was the cause? Simply, as I see it, an almost deliberate attempt to throttle industrial enterprise. The proof? As I see it, simply this:

In these same ten or twelve years since the collapse in 1929, we have had an advance in technology that has never been surpassed if it has been equalled, in any country in the whole history of the world. And we had vast sums of capital, ready, eager, one might say, for investment. Money rates went down, down, down, to the lowest point in their history and there were no takers. What was the trouble? Simply that the incentive was gone. What incentive? The mere love of making money? I doubt it. Men who work hard long after they have attained affluence or wealth no longer continue their exertions merely to add to their possessions. It is the joy of doing things, of achieving, of feeling a sense of mastery and command, grappling with large undertakings. In brief, the spirit of American enterprise.

Ours was never a war-like country. We have almost no one to make war upon or with. There seems reason to think that the original American colonies would scarcely have broken away from the mother country if it were not for the onerous taxation and worse than that, a high handed sort of domination, that was irksome to the American spirit. Even at that, there was a very strong opposition against the War for Independence, estimated by Woodward to comprise perhaps a full third of the country. Many of these had other, larger and more inviting fields for their energies and their ambitions.

So, when Independence had been won and it became quite clear that Watt had made a successful steam engine, and that Stevenson's locomotive was a success, America was soon in the front rank of countries eager to take advantage of these new means, and avenues, to Power. Many men made great fortunes. They created huge enterprises which aroused, in the hearts of many, deep envy and jealousy. George Washington was probably our first real millionaire but his investments lay in land. And of this there was an abundance. It was when great fortunes began to be made in the railways and their like, and the great enterprises to which they gave rise, that the feeling of deep antagonism to this kind of wealth arose. It is true that one of our earliest "revolutionaries," as we might call them, was Henry George, and that his fetish was the land. But that was after the richer land had begun to become scarce and the growth of the population created huge land values. But he never attained any great following. It was the railroads that raised the great cry of "monopoly," still strong in the days of the youth of some of us.

Now I have always thought that there was a grave defect in our economic teaching in the colleges and universities, since they did not explain, in a clear and simple way, that in reality these "monopolies," and great enterprises which were not essentially monopolies, were a vast advantage to the whole population. That the great enterprisers could not make their vast fortunes save by literally serving the public, cheapening the means of transport, opening up new pathways to the richer lands, taking hold of new inventions that cheapened goods to the entire country.

In brief, that they could only succeed by literally serving the public. And this defect, I fear, still more or less exists. Even among collegiate folk and teachers of economics there is still a latent feeling, as among a large part of the population, that somehow great fortunes are an "evil," that they are "wrong" that no one man has any right to such great riches; and that ways ought to be found to curb their "vast powers,"—for the most part, aside from the particular industry in which they are engaged, quite imaginary. Not one of our great millionaires of past or present days, the J. J. Astors, and the Vanderbilts, and the Carnegies, and in our own time, the Fords and the Rockefellers, and the like, has ever attempted to use his wealth to corrupt our elections or to gain advantages that were not, for the most part, open to the enterprising spirit wherever it is to be found.

Nevertheless, along with this spirit of which I spoke, grew up the idea that somehow these rich men absorb or gain possession of "an undue share" of the national wealth. But how are these great acquisitions utilized? And how much of the national wealth do they really "absorb"?

It is an amazing revelation of statistical investigation within quite recent years that the net earnings of capital are, for the most part, extremely small. Taken over enterprises as a whole, they are something on the order of 5 or 6 per cent, not more. Some keen observer once remarked that men who have made large fortunes really work for nothing; they could rest on their oars, could give up business, and put their money out at interest at rates almost equal to the normal gain. And at much less risk than in the ordinary run of business.

But this is precisely what they do not like to do. Men of great energy and acquisitive powers do not want to let go, as a rule, until their later years. It it the joy of doing, the sense of achievement, the feeling of mastery, that spurs them on. And, as I see it, it is this kind of energy which has created the vast wealth of this nation.

There are relatively few successful businessmen. It is well known that the great majority who attempt to enter business and have enterprises of their own fail and often quite miserably. The distribution of talent in enterprise, we now know, follows much the same line —as we say nowadays, the same curve— as the distribution of every kind of ability, as the musicians, or painters, or poets, and if you like, the soldiers, too. Grant was a great success as a soldier, coming up from utter obscurity and actual poverty, to become, when the opportunity offered, perhaps our greatest military genius. So at least, estimated by some of the ablest writers on military tactics. But he was a complete failure in the field of business. He was as credulous, almost, as a child.

Now the amazing thing is that the utilization of this talent for management

and trade and enterprise goes for the most part to the benefit of the whole population and not to the spectacular few who make a great success. Every great enterpriser is equally a great benefactor. And he could not make this success, he could not gain riches, without a corresponding gain or benefit to all the people. This, as I see it, is the very essence of the great success of what we call the Capitalistic System, in that it enlists the energies and the acumen and the ability of especially talented men in these particular fields. It is relatively rare that our rich men have gained their fortunes through what are called monopolies. There are a few conspicuous instances, of course, but not the general rule. The general rule is the reverse. Let us take, for example, our great general stores spreading now over all this country and which were beginning to spread into other countries, cheapening goods to the entire population. They could not succeed otherwise. They could only gain large profits, literally by serving the needs of the people.

Your own industry is one of the most spectacular instances of this. In the electrical industry today, an investment of something like 12 to 14 billions of capital. Whence has come the great success and profit of our electrical industry? Simply by making light and power cheaper and more accessible to every man, woman, and child in the country, bringing conveniences of which we never dreamed before.

Whence came this capital, this vast accumulation of wealth? From the industries themselves very largely. The railroads, electrical power, and all the rest have served the public by cheapening light and power and goods, and in no other way. And their profits have been astonishingly small when we estimate the percentages. Something like 4 or 5 per cent per annum. This is the toll which capital takes from industry! And how does it utilize it? Always to expand each particular industry to the utmost. The working of this Spirit of Enterprise. The key and the story of every great field of endeavor in this country. And if we could only understand how small is this toll which great industries take, if you please, which capital takes, there would not, I believe, exist this feeling of antagonism to great successes in the field of business—the feeling that there is something "wrong" and that it ought to be "corrected by law," that earnings should be limited, when, as a matter of fact, the greater the toll that capital takes the greater the fund of capital for new enterprises and the expansion of the old. The story is so simple, so clear, so unequivocal that it seems strange that it could not have been made obvious and evident to the masses, who are the beneficiaries of this accumulation.

It is only by the concentration of wealth in the hands of the relatively capable few that great enterprises such as have characterized the industry of this country have been possible. We all recall the adage of Emerson that he who will make a better mouse trap will find a beaten path to his door. That is the whole secret of capitalistic industry—that it makes better goods, and cheaper goods, than could have been possible in any other way, through the utilization of this executive and business ability in management.

In a word, it is only as capitalism becomes the servant of the people, giving them cheaper goods, higher wages, greater buying power, that it succeeds. There is no secret about it and yet it seems strangely foreign to our current modes of thought and feeling. That great wealth and especially its ostentatious display should arouse deep feelings of antagonism and animosity is human nature. But there is something beyond mere feeling. There is the question of intelligence and understanding. If today we have or have had millionaires who have given away vast fortunes—three-quarters of a billion in one instance, and one-half a billion in another, it has not been from the deprivation of the masses, but only possible as it has served the masses, made life easier, the hours of toil shorter, the goods and conveniences that they are able to command so cheap.

So it seems to me that instead of attempting to tax this wealth away from its possessors, imposing heavy duties upon their estates, we should endeavor to conserve it and promote it in every way possible. Take, for example, the simply fabulous extension of the electric light. If it were not for the convenience of the people, if it did not add to their comfort and literally also to their ability to work, does anyone imagine that almost every home in America would today strive to have electric lights and power for the multiplied conveniences which are now available through the cheap distribution of electricity? Who has been robbed? Who has been harmed by this process? And the same has been true of almost every industry that can be named. Take farm implements. No longer is there any need for long hours of brutalizing toil by the farmer to make a meagre income. This is solely possible through the invention of new kinds of farm machinery and their production at low prices, within the reach of almost every enterprising possessor of the land. The same with our railroads, against which there existed not long ago such a deep feeling of antagonism. They brought cheap transportation and literally means of livelihood to millions of people. They could only have been built and developed by the use of vast amounts of capital; probably at least 30 or 40 billions of actual money. And who has been harmed by the toll they have taken? As in every industry, the only way which these great expenditures of capital could be made profitable was to make them profitable to the whole population. If the builders and owners of the railways took their modest 5 per cent, let us say, of the incomes they acquired, the benefit from the other 95 per cent from this investment reached into almost every town and hamlet in the nation.

I would like to see our teachers of economics and allied subjects rise up to make this miracle of modern industry, and its achievements clear to the humblest man, to make him feel that he too has shared in large degree according to his ability from all this vast expenditure, that it is capital and capital alone which has created these great industries and made the large accumulations that flow from them possible. If all this could be made evident and convincing to our 60 or 80 millions of adult population, I doubt if we should today be where we are, or where we have been some time, standing still industrially, for 10 years and more. A situation wholly, as I see it, the product of ignorance and jealousy and short sighted antagonism.

There is yet another phase of the present situation that I touch with great reluctance, because of my profound feeling that this country has, in this hour of crisis, a great duty to perform. In the interest of humanity and of progress, it would seem that only the United States can save our Western World from the most horrible fate that has threatened civilization since America was discovered and for a long time before that. Almost a reincarnation of Genghis Khan.

Holding this belief, in the most ex-

treme degree, and supporting every effort this country can put forth to prevent another genuine invasion of barbarism, I speak reluctantly of a phase that is disturbing; the widespread belief that somehow we can throw the burden very largely upon the wealthy and well-to-do. A perennial delusion, that seems deathless. The rich can not pay for this war, alone. The whole population must pay, and pay in a deferment of a continuation of our splendid industrial advance of the last 150 years. It is an obvious corollary that if Capitalism is literally as I have termed it, an institution "in the service of all the people," we cannot spend billions upon billions of dollars on war, and not pay for this in deferred benefits and the realization of a glorious future that would otherwise be ours.

There is one way and one only in which the whole people can share in prosperity, in the form of higher wages and better living and that is by the increase of the production per worker. And this, in turn, is possible only through the introduction of new machinery, new methods and, if you please, new industries.

All this requires, of course, vast expenditures of capital. The increase in wages of the last 100 years or more has been solely due to the steady increase of the capital supply. And this must inevitably be deferred if the whole of the available capital is to go into the unproductive form of war expenditure.

It must be clear to any thinking man, therefore, that we cannot continue our usual rate of expenditure and improvement merely by printing money, which is virtually what we are doing now. It it very clear likewise, that we ought now to be deferring every kind of expenditure that does not go directly into the war. The slogan has gone forth: "Business as usual." That is impossible. We are spending billions by printing money in the form of bonds, which can only lead to a disastrous inflation unless we can curtail expenditures correspondingly in other ways. Very literally, we cannot have our cake and eat it too. There has been a continuation of all the worst features of the past 10 years—an insane belief, as I view it—that we can somehow "spend our way to prosperity." That is not the way prosperity has been created in the past, and it cannot be true now. We are suffering from the vast delusion that somehow we can gain the desired goal without paying for it. The issuing of bonds is, of course, a close approach to printing money. It is filling this country with a delusion that this war expenditure will mean prosperity. But we shall pay for it, dollar for dollar, in deferred industrial progress.

Yet some of our Congressional Solons, and many others, think we can raise wages, increase domestic expenditures for the good things of life, pay higher and higher wages which mean greater and greater luxury expenditures, and not pay for it in a monstrous future loss. I am aware that this is not palatable doctrine to urge at the present time; an economy of expenditure and not extravagance. I am quite aware that there are many who hold that by an enormous augmented industrial effort we can somehow continue our present scale of living and even increase it by some form of economic magic. But extravagance is not the solution. It is a vast delusion that we can somehow continue our present colossal scale of Government expenditure and, by means of huge issues of bonds and by heavy taxation largely falling upon the rich, that we will, in the end, come out a gainer.

War is waste. The only possible way we can meet this waste and not bring on all the perils of inflation is by curtailment of expenditure. And we seem possessed to do precisely the opposite. Economic ignorance has cost this country dearly in the past, but never, I feel, to such an extent as at the present time. The last 10 years and more have burdened the nation with a vast debt such as we have never had since the Civil War. That expenditure then brought on a period of wild speculation ending in the collapse of '73, with all the unrest, the discontent and genuine suffering which it entailed. And there was then abroad this same deep feeling, in many minds, that there was something wrong with our economic system when, as a matter of fact, it could all have been predicted, aforetime, and foreseen. We have seen Germany go from a deep depression into the wild schemes of a maniac, utilizing its energies in building up a vast war machine which is disrupting Europe and bringing the whole civilized part of the world into disorder. It will cost Europe years of painful stagnation to recover. I have faith that it will recover. But whatever the outcome of the war, it seems almost certain that our present scale of war expenditure without adequate retrenchment will bring to this country disastrous inflation and, with this much the same social discontent and desire for governmental intervention that has characterized every depression we have known in the years gone by. But on a far greater scale, for inflation invariably spells depression and collapse.

Whether or not our free institutions can survive popular ignorance in this field, the strange delusion that somehow governmental expenditure can accomplish wonders now, as it never has before, only the future will reveal. We seem bent upon sowing the seeds of disaster, regardless of the clear consequences of our present course.

We have behind us a magnificent past. Let us beware that we do not establish here the conditions that have created such insane delusions as prevail today in Germany.

Industry and National Defense

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that on the first day of the assembly the delegates from Germany, Italy and Russia withdrew from the deliberations and returned home. The totalitarian governments do not recognize a tri-partite system of industrial government. They know but one system—that in which everything is centered in the state. Industry and labor alike have no place in such a system. All interests, no matter where they may be in these dictator countries, are subject to the lash and whim of the unprincipled leaders which control them.

Again I say, both industry and labor have a terrific stake in the preservation of a form of government which permits free association and free operation.

Those who have studied industry's position toward war will recognize its constant position that the lethal poison of resort to arms shocks and destroys the sinews of civilizations. American industry has continuously and energetically declared itself vigorously against military aggression. It is only natural that the American people are peace loving. Our history and our traditions have been built on this great fact. However, it would be naive indeed for anyone to believe that the stout hearts of America will permit any possibility to arise which would deprive our great country of its sacred prerogative to live in a republic founded on sacrifice and hard work by our inspired forefathers.

With these thoughts in mind I think it appropriate to repeat here a pledge made by 15,000 manufacturers and forwarded by Walter D. Fuller, president

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Basic Factors in Power Interconnection Agreements

By J. E. Moore

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A paper presented in summary form as an address before the Fourth General Session of the Ninth Annual Convention of the Edison Electric Institute, Buffalo, N. Y., June 5th.

THE purpose of this paper is to outline certain factors and principles involved in agreements between non-affiliated private enterprises for interconnection of their systems and for coordination in the operation of their power supply sources.

While generally similar principles apply to arrangements between affiliated utility enterprises or between private enterprises and governmental enterprises, the basic factors can be analyzed more simply if their application is limited to agreements between non-affiliated private enterprises.

These factors and principles are of sufficiently wide applicability to be of general interest, although it is not easy to generalize with respect to forms of interconnection agreements. Conditions and problems vary widely, and the contractual arrangements in each particular case naturally tend to be built up around the factors which in that case are predominant. At the outset there is disclaimed any intent to advocate standardization of contractual provisions or operating arrangements.

TIMELINESS OF SUBJECT

Today a new emphasis and in some respects a new significance attach to system interconnections. Immediately, they are of vital importance to the defense program. The impact of the defense program upon electric power systems is just beginning to be appreciated, for the reason that the defense program itself is just beginning to be understood. When the magnitude of the defense production program doubles within a period of relatively few months, the power requirements for that production likewise double. Where the progressively increasing production will be located, and where the progressively increasing amounts of power will be required, are questions the answers to which are only partially known. Many new loads will be served in 1942 and 1943 which, as to particular localities, are not even prospects now. Our executives and engineers, in cooperation with the defense agencies and the Federal Power Commission, are putting this situation ahead of anything else.

MR. MOORE

For operation in 1942, no new generating units of economic size, other than those now in process of construction, can be made available. For operation in 1943, the situation as to manufacturers' facilities and floor space, and as to critical materials and skilled labor, definitely limits the aggregate capacity of new generating units which can be produced. This limited aggregate of new units must be divided between utility system plants, large industrial plants and government plants; priorities may affect unexpectedly the destination, as to specific localities, of the generating units which can be produced for 1942 and for 1943.

However, new generating units are not our only sources of additional load-carrying capacity. Both for 1942 and for 1943, an amount of effective load-carrying capacity can be made available by suitable interconnections which will constitute a far larger addition to our power resources than is generally recognized. If intelligently planned and located, if carefully coordinated with existing facilities, and if operated with full effectiveness, such interconnections will not only create substantially new load-carrying capacity, but they will do it quickly and without serious inroads upon critical materials. They will make both existing capacity and new capacity available over wider areas, a tremendously important advantage in view of present uncertainty as to where greatest power demands will materialize. Later, such interconnections should assist significantly in meeting post-war economic problems, such as local over-development of power sources and shifting of load centers.

Viewed merely as a method of gaining additional capacity which is alternative to construction of new generating facilities, interconnections will often show greater overall economy both from a short-range and from a long-range viewpoint; but in many defense situations the issue is not one of alternatives it is one of urgent need for all the additional capacity which can be gotten by both methods.

Moreover, the new significance attaching to system interconnections does not arise solely from the defense emergency. The electric utility industry would in any event still be facing the problems of growth, not merely growth in magnitude of loads and facilities but growth as to character of facilities and as to methods of operation. In the pattern of the industry from now on, interconnection and coordination will be outstanding features. Most systems which do not already have external interconnections do have internal high-capacity networks which are natural bridge-heads for interconnections. The industry is reaching a stage also when existing coordination may need to be extended and when iso-

lated or semi-isolated operation of power sources will often no longer stand the tests of adequacy, flexibility and minimum cost. The industry must and will meet the coming problems of growth by whatever means may be required to meet them.

We come now to the fundamental issue to be considered in this paper. Interconnections are cooperative projects involving financially and corporately independent enterprises, each with its own management and each with its separate responsibilities to consumers and investors and to the welfare of the territory it serves. If of substantial capacity, interconnections may involve large investments. They may substantially affect the future development of all of the systems involved. Service in one system may become partially dependent upon conditions in another. Realization of the expected benefits depends upon future effective cooperation between independent organizations. Hence, the managements of the respective enterprises face important issues in setting up the agreements which establish their respective obligations and rights in such a cooperative project.

In some cases, perhaps, exaggerated apprehension as to the difficulties and uncertainties involved in interconnection agreements and in subsequent coordination of operation may have been an unnecessary deterrent to consummation of projects which would yield important mutual benefits to the parties involved and would be of substantial public advantage.

BENEFITS FROM INTERCONNECTION AND COORDINATION OF POWER SUPPLY

Before considering the types of transactions involved in interconnection arrangements, it may be of assistance to review briefly the potential benefits to be gained.

1. Saving in generating capacity by taking advantage of load diversity. Load diversity may arise from difference in shape of seasonal or daily load curves, this difference in turn arising from such causes as different proportions of urban and industrial load, different time zones, large proportion in one system of certain seasonal industries such as irrigation pumping or processing crops, or of certain one-shift industries or of seasonal services such as summer air-conditioning or casual electric heating in mild climates where many homes do not have central heating. For convenience, this type of load diversity, arising from differences in shape of load curves, may be called "schedulable diversity." Load diversity also arises from the condition that even during heavy load seasons the peak loads on any system usually vary considerably from day to day and from week to week, while the similar peaks in a neighboring system are unlikely to occur in the same days or weeks. In other words, casual deviations up and down from the average trend of daily peaks in one system are likely to offset rather than superpose upon similar casual deviations in another system of an interconnected group. Effect of dark days on afternoon lighting and effect of rain on drainage pumping are sometimes striking illustrations. This second type of load diversity, which may be called "casual diversity," is probably more important than is generally recognized; statistical studies of loads in neighboring systems, and extensive experience in existing interconnections, show that it can safely be counted upon for significant capacity savings.

2. Saving in generating capacity by reason of diversity in demands upon reserve facilities. This reserve diversity arises mainly from unlikelihood of simultaneous emergencies in two or more systems, but in part it results from ability to coordinate maintenance and inspection schedules. For systems in which the size of individual units is large in proportion to total capacity, this reserve diversity saving may be of substantial importance, and even between very large systems it is significant.

3. More effective use of surplus generating capacity, since surplus in one system can be available for unexpected load increases in any of the interconnected systems.

4. Economy interchange. Savings in production cost are possible whenever and for so long as one system might otherwise have relatively high-cost capacity in use and another system at the same time would have lower cost units idle or partially loaded. In some cases, economy interchanges may tend to balance over a period of time; more often there will be sufficient differences in fuel prices or in types of generating facilities so that economy interchanges will be predominantly in one direction, often continuing for a high proportion of the 8760 hours of the year. Frequently, economy can be effected by having one system operate more than its proportion of spinning reserve equipment, with other systems operating more than their proportion of load-carrying equipment. In addition to the direct savings from economy interchanges, further savings result from greater steadiness of turbine and boiler loadings and from greater precision in scheduling loads upon units and stations.

5. Staggering or rotating development of new capacity in the several systems. In some cases this obviates temporary over-development and hence saves capacity, and in other cases it makes feasible the installation of larger and more economical generating units, saving both capital investment and operating cost.

6. Opportunity for intersystem firm power sale. In some situations, such as availability in one system of low-cost fuel, the flow of low-cost energy into a higher cost area may represent a permanent source of saving. Usually in such cases the permanent unbalance in intersystem flow would be so limited as not to reduce unduly the interconnection capacity available for other interconnection uses.

7. Mutual protection against extraordinary breakdowns, fuel shortages and other emergencies.

8. Improvement to service, in some cases, in outlying portions of the systems between which the interconnection is made.

9. Where hydro generation is involved, still further savings in capacity and in operating costs may accrue from diversity in stream-flow characteristics between different watersheds, from more effective use of water storage, from more complete utilization of dump energy during flood seasons, and, in particular, from more complete development of low-load-factor hydro installations for the carrying of high short peaks for a group of interconnected systems and for short duration emergency service.

PROBLEMS ARISING FROM DIVERSITY OF OWNERSHIP

In a case of two non-connected parts of a single system, if an economic study discloses substantial overall benefit from a high-capacity interconnection as compared with installation of an equivalent amount of new generating capacity, or if the urgency of the need for power indicates that such an interconnection should be the next step in development, the interconnection presumably would be made forthwith. The separate economic effects upon the component parts of the resultant integrated system would have no significance, except possibly as to allocation of costs for determination of regional rates.

Where, however, the component individual systems are not of common ownership, the problems of immediate and ultimate economic effects upon the individual systems decidedly do arise. The potential benefits may be just as great as between parts of a single enterprise (presumably they would be, except in cases where sales taxes might constitute something of a barrier), but the management of each system must face two vital questions:

First—What assurance have we that an adequate degree of operating cooperation can be established and maintained to permit the expected benefits to be realized?

Second—What assurance have we that our system will receive, immediately and especially in the future, a sufficient portion of the benefits to cover carrying costs on its investment, plus a reasonable share of any further net benefits?

There is, of course, no such thing as absolute assurance with respect to the investment in any program. There is no such thing as protection against all uncertainties and adverse contingencies, and recognition of risk is a normal process in reaching executive decisions. The only unusual feature here is that interconnection and coordination of power supply involve cooperation with others. The only degree of assurance really needed is that this unusual feature shall not increase unduly the uncertainties naturally inherent in any development program.

Reasonable assurance becomes more tangible when we pass from abstract consideration of potential benefits to an analysis in a particular case of the specific transactions through which the benefits will be realized. From such analysis there will be found, first, two favorable underlying factors:

(a) Continuing existence of potential benefits is a continuing incentive to the cooperation essential to secure those benefits.

(b) The parties to the arrangement are engaged in similar enterprises and have similar objectives; hence, each understands the problems of the other. This facilitates cooperation.

Next, there will be found certain important self-protecting factors, one or more of which will apply to most types of interconnection transactions:

(a) As to many transactions, the apportionment of the potential benefits may be made largely automatic.

(b) The parties presumably enter initial negotiations in equally good bargaining position; hence, they are equally able to protect their respective interests as to apportionment of investment burden and as to specific arrangements for transactions in the immediate future.

(c) While a considerable degree of future flexibility is desirable, it is a fair presumption that in the main the parties will be in approximately equal bargaining position when arrangements for future types of services need to be made or when existing arrangements need to be modified.

NATURE OF TRANSACTIONS IN INTERCONNECTED OPERATION

The extent to which the separate interests of the participating parties are, or can be made, self-protecting, is a factor which affects the whole structure of interconnection agreements. It is pertinent, accordingly, to examine the nature of typical interconnection transactions from this viewpoint.

Load Diversity Transactions—A basic approach is that the saving in generating capacity made possible by utilization of load diversity should be shared equally in two-party arrangements, or in proportion to the origins of the diversity in arrangements involving more than two parties. The essential transaction then is that one system receives a certain amount of power at the time of its own maximum loads, in return for which it delivers an equivalent amount of power at the time of the maximum loads in the other systems, when its own loads are lighter. While the amount of load diversity available in future years is subject to the uncertainties involved in any load forecasts, the arrangements can be so set up that each party is assured of benefiting by its own proper share of whatever load diversity does exist from time to time. The advance estimates and specific detailed arrangements involved in the transactions need not be very elaborate and do not involve any significant conflict of interests likely to result in controversy, inequity or stalemate. Essentially, the apportionment of benefits is automatic.

Reserve Diversity Transactions—The basic principle is that each system can save generating capacity to the extent that its proper share of an adequate joint reserve will be less than its adequate separate reserve under independent operation. The essential transaction is that each system undertakes to maintain its proper share of the aggregate reserve, and, having done so, is entitled in the event of trouble to call upon another system for reserve assistance to the extent necessary to carry its load, which reserve assistance the other system is obligated to supply to the extent it has the capacity available. With respect to specific arrangements as to reserve diversity, both as to installed reserve and as to spinning reserve, certain problems can arise:

(a) If the agreement does not require each party to provide reserve capacity in some definite amount or on some definite basis, an inequitable situation could develop in which one party keeps itself in position to supply, and does supply, a valuable service to the other, but is unable to count upon reciprocal service in time of its own need. Partial protection against such inequity may be afforded by a charge (in addition to the energy charge) on a kilowatt-day basis for use of reserve service.

(b) If the agreement provides for fixing each party's share of an aggregate reserve, controversy is possible from time to time as to adequate amount of aggregate reserve and as to each party's proper share thereof. Such controversy is not likely to be serious unless the service standards of the respective systems are considerably different. In case of any such controversy, the larger system, or the system with the higher service standards, is likely to be in the weaker bargaining position. One protection against stalemate would be a contractual formula to fall back upon in event of failure to agree. It is relatively simple to provide contractual protection against failure to maintain the assigned amount of reserve.

In general, as to mutual reserve service, likelihood of really serious inequity is not great even if there be no contractual provision for protecting one party against the other, and it is possible to provide fairly effective protection.

Economy Interchange Transactions—Mutual incentive to economy transactions is always present, and various devices are practicable to make equitable division of savings automatic. The usual arrangement embodies some form of the split-savings principle. Where conditions are sufficiently predictable, a block of secondary or dump energy may be contracted for a definite period at a fixed rate, with the way open of course for additional economy interchange on other bases.

In three-party interconnections, possibly conditions might arise where the bulk of economy exchanges were between two parties due to the third party being in a median position as to increment energy costs. In such event, the third party, if it had made a pro rata investment, might find itself having few economy transactions and hence receiving little benefit in this particular respect. Ordinarily, over a series of years, a sufficiently good balance could reasonably be anticipated, but, if needed, specific protection can be afforded in various ways, for instance by shifting some of the investment burden or by providing that some portion of two-party economy savings would go to the third party in recognition of its contribution to the investment which made the savings possible.

Firm Power Transactions—With respect to firm power transactions, either long-term or short-term, and either initial or in subsequent years, the respective parties can usually be assumed to be in relatively equal bargaining position. While savings from possible future firm power transactions may constitute an expected benefit from the interconnection, there appears to be no necessity under usual conditions for initial contractual protection of one party against the other. In particular, arrangements for staggering or rotating of successive installations of generating capacity, with attendant short-term firm power sales, need not be formal continuing arrangements; each step can be arranged independently. This need be no barrier to long-term coordination of power development as distinct from operating coordination in power supply. Pride in being self-sufficient and aversion to interdependence are likely to be less serious obstacles as experience with interconnected operation accumulates.

Formal coordination of power development (as distinct from operation) supported by long-term contractual obligations may in some cases be advisable, particularly where joint development of power sources is involved, but such arrangements are beyond the limited scope of this paper.

Interchanges Involving Hydro Energy—Interchange and other transactions between two systems, one or both of which has energy sources which are predominantly hydro, frequently can effect large savings in amount and cost of installed generating capacity and in operating expenses, as well as other benefits. The nature of the potential savings and other benefits and the types of transactions through which they are realized cover such a range that general analysis is not

practicable. Upon study of particular situations, it will usually be found that one or the other of the self-protective features noted above will apply to most types of transactions. As to virtually all of such hydro transactions, the benefits are mutual and the incentive to cooperative agreement is strong.

NATURE AND TYPES OF INTERCONNECTION AGREEMENTS

General Approach

In most types of interconnection arrangements, the realization of the expected benefits requires cooperation. Cooperation cannot be imposed or compelled. Cooperation cannot be attained merely by the signatures of executives to a contract. Cooperation rests upon obligations voluntarily assumed by free agents for an adequate reason. It implies sincerity in devotion to the joint objective of best overall results, willingness to accept a fair break where there is diversity of interest, and confidence in the similar integrity and fairness of the other side. Such a foundation is important in any interconnection arrangement, however limited its purpose and however specific its contractual provisions; it is essential in an arrangement which contemplates real and full coordination of power supply, where the purposes are broad and the contractual provisions cover principles rather than specific details. Hence, the contractual procedures established should be such as to make cooperation easy and to set up as few hurdles as possible.

Basically, except as to firm power transactions, if maximum aggregate benefits are to be attained, the benefits to each party individually should be derived primarily from the value to it of the services which it receives, not from profits on the services which it supplies. This is important. The free intersystem flow of services should not be checked by fixed rates and tolls, rigid terms of settlement or arbitrary margins of profit to the sending party. Such features can be barriers in the way of the transactions through which alone the potential benefits are realizable. Reciprocal types of interconnection services should, if practicable, be permissive as to receiver and obligatory as to supplier, in which situation the incentive to the receiver may need to be strong.

The principle just noted, need for incentive to the receiver, is urged despite possible apprehension as to comparisons with charges and services to consumers and to regular purchasers for resale. Considered in their broad aggregate, interconnection services are reciprocal; as to certain services they are directly reciprocal. The relation between the partners in an interconnection is that of mutual assistance between producers, not that of sale by producers to consumers or distributors. Such reciprocal transactions between producers may often be on an incremental basis. No proper inference can be drawn that similar terms would be suitable where such a reciprocal situation does not exist.

The conditions under which interchange services are supplied, and to some degree the nature of the services themselves, will vary from time to time during the period of a long-term interconnection agreement. Hence, the provisions of the agreement should cover objectives, procedures for accomplishing these objectives and general principles of settlement. They should embody flexibility to meet changing conditions and should avoid rigid prescriptions of detailed arrangements, at least in so far as practicable consistent with reasonable protection to the individual interests of the parties and consistent with the securing of a legally valid and enforceable contract.

In particular, a long-term interconnection agreement should avoid specifying minor technical details, such as exact metering layout, specific figures or formulae for transmission loss adjustments, precise and rigid specifications for computing incremental energy costs, etc. Almost certainly, such details will change, or should change, with the passage of time. To embody them in long-term contractual provisions serves no useful purpose and adds unnecessary complication and confusion. As they become obsolete, either they are ignored, which is undesirable, or they result in injustice to one party, which not only is detrimental per se but is a handicap to maintenance of a cooperative spirit, or as a last resort there must be invoked the elaborate procedure of amending the contract and securing approvals of regulatory agencies having jurisdiction.

Previous references to need for flexibility, to avoidance of specific detail and to future equality of bargaining position may require explanation. The last implication intended is that a satisfactory arrangement might consist merely of building the interconnecting facilities and leaving the terms for specific transactions to be worked out from time to time on a basis suited to the circumstances, with the transactions themselves wholly permissive. Interconnections involving substantial investments have been made on such a basis, and the results have usually not been praiseworthy; a major part of the potential benefits has remained unrealized.

The objectives should not be set up in the abstract as pious declarations of intention. All continuing objectives and any special objectives contemplated in the near future, should be embodied in specific types of transactions, as to which principles for settlement are clearly expressed and for the consummation of which procedures are definitely established. With respect to transactions the primary objective of which is capacity saving, the initiating procedures should be as mandatory as practicable, the service to which a party is entitled should be clear, and consummation of a transaction should involve only a call by a party for a service obviously advantageous. Even with respect to essentially permissive transactions, such as economy interchanges, the procedures should be such that for normal cases the party to be benefited needs only to call for the service, knowing in advance what the terms of settlement will be (except in certain special cases, such as those involving storable hydro energy).

It is important, especially in the early stages of an interconnection project, that there be a sufficient volume of transactions to insure that the respective operating staffs be accustomed to working together. Under such conditions, where special agreements may be needed to make possible certain types of transactions, such agreements are greatly facilitated.

Flexibility in interconnection arrangements involves sufficiently broad authority and responsibility for operating committees, contractual provisions under which adjustments for changed conditions may be made without disturbing the basic contract terms, all practicable precautions against stalemate in effecting needed adjustments, relatively short effective terms initially for arrangements for certain types of transactions as to which neither party is likely to be handicapped in working out subsequent arrangements, and in some cases back-up provisions not normally applicable but which come into effect in certain contingencies until other arrangements are made. A way should be open to carry out, under the agreement rather than outside of it, advantageous special trans-

actions not covered by specific arrangements in effect at the time.

Flexibility does not mean merely that provisions should be subject to revision or supersession. There should be intelligent planning as to limitation in the scope of revisions and as to the conditions under which revisions will be worked out.

An inexcusable defect is incorporation of unimplemented general provisions which are vague or ambiguous and which tend to invite future dispute. Foreseeable problems should be faced squarely. Evading them in drawing the initial agreement evidences laziness or shortsightedness in the negotiators and contract draftsmen.

Amendment of the basic terms of an agreement, except for an important reason, is something it is wise to avoid. Frequent resort to amendment, except for adjustments as to which procedures are established in the agreement itself, creates an atmosphere of instability, with consequent encouragement to seeking solutions to disputes not by honest practical endeavor to make a reasonably sound existing plan work; but by trusting to superior astuteness in juggling contract provisions.

A different situation is presented in cases where an interconnection already exists, with some rudimentary degree of power coordination. There are numerous such cases where major interconnection benefits are not yet being realized. If it is planned to increase interconnection capacity, and especially if it is planned to establish more effective coordination, then probably the satisfactory course will be to forget any old agreements and policies and to start from scratch on a new agreement.

Scope of Interconnection Agreements

Interconnection between systems is by no means synonymous with coordination of power supply. Coordination of power supply may be considered to be the ultimate development of interchange transactions just as a grid network is the ultimate development of transmission interconnection.

Essentially, coordination of power supply means that the aggregate power sources of the interconnected systems are operated for the supply of the aggregate load, quite irrespective of ownership. Except as limited by the requirements of service protection in local areas, each step of increasing load is dispatched to the available source having the lowest incremental cost, and each step of declining load is met by dropping the operating source having the highest incremental cost. Storage of water in each reservoir is regulated on the basis of overall requirements. Coordination implies some type of common load dispatching based upon overall economy and service reliability, irrespective of the magnitude or nature of the resultant inter-system power flows, leaving the subsequent job of unscrambling the inter-party transactions to accountants and cost engineers. Inasmuch as dispatching for best overall economy is guided largely by incremental production costs, it follows that settlement for certain types of interchange transactions may need to be based upon incremental production costs.

While full coordination may be in theory a prerequisite to maximum overall economy, yet frequently all major economic benefits which are possible of attainment may be substantially realized without such an elaborate degree of coordination. Obviously full coordination is physically impossible except where the direct interconnecting facilities and internal connections thereto are of adequate capacity to handle the large shifts in loads which may be involved. Even with high capacity interconnections there may be various legitimate obstacles to full coordination involving common load dispatching and settlements based on costs. In some cases, particularly where the component systems may individually be involved in other interconnections, full cordination, even if practicable, may be too complicated to be worth while attempting. There is no intent to disparage the effectiveness and good economic results which are being secured in many arrangements which stop short of full coordination.

For interconnection where full coordination is not to be a contract objective, the interconnection agreements may take a variety of forms, determined largely by the transactions which are most important under the conditions obtaining. In particular, there may be no necessity for formal coordination of dispatching, for joint specification of reserve capacity requirements or for direct use of incremental energy production costs in interchange settlements.

Contrasted with agreements embodying partial coordination, in cases where full coordination of power supply is an objective, interconnection agreements are broader in scope and require setting up of some formal coordination methods and personnel. Contractual provisions usually embody less specific detail and incline more toward establishing objectives, principles and procedures; this results both because greater flexibility is needed for full coordination and because the established coordination methods and personnel will be able to care for specific details which otherwise might need to be included in contractual provisions.

For large systems, no new burden should result from the elaborate attention to economics of power dispatching and the continuing research into production costs. If they should look like expensive luxuries, it might be pertinent to investigate whether their absence from current operating procedures may not represent an even greater expense.

In some special cases where the systems involved are large enough to justify the expense, and where the interchange transactions are complicated and important, a jointly employed Interconnection Manager may appear desirable, at least for the earlier years of interconnected operation. If employed, his basic function would be supervision of the working mechanics of interconnected operation and continuous forward-looking study of interconnection problems to secure best results in economy and quality of service. As a competent and informed person in a presumably impartial position, he would naturally be helpful in promoting cooperation, and in practice might have the deciding voice in a number of specific operating committee arrangements, such as apportionment of installed reserve capacity requirements and spinning reserve requirements, detailed methods of computing incremental energy costs, and methods of making and reconciling load and diversity estimates. He should have responsible supervision over load dispatching between systems and possibly some degree of advisory supervision over internal load dispatching, but he should have no responsibilities as to station operation.

Types of Interconnection Situations

The most frequent type of interconnection agreement is two-party, even where one or both of the systems involved may have other interconnections with other systems. Two-party interconnections are the simplest to operate, and two-party contracts are the simplest to draft and to administer.

Sometimes, however, the physical and economic situation clearly calls for interconnections involving physical ties and contractual arrangements among three or more parties. Occasionally the systems of the several parties may each be joined to all of the other systems in a

network interconnection. More often, in a three or four-party group, interconnection between some of the component systems is only through the system of another, i.e., a chain type interconnection. In extreme cases in a chain type interconnection, the major interchange transactions are between end systems, with the intermediate system or systems serving as a transmission link, either by through transmission or by substitution transmission.

In setting up agreements for chain type interconnections, adequate investigation and consideration are needed as to the economic and equity position of the intermediate party or parties. An intermediate party contributes something which the end parties do not,—the use of its pre-existing facilities for transactions between the end parties, in which transactions it is not a direct beneficiary.

There probably will be a variety of ways in which the intermediate party can be sufficiently protected or compensated, among them (1) reduced proportion of direct new investment required for interconnection, (2) investment equalization charges which may take into account to some degree the uses made of the investment in the party's pre-existing facilities, (3) minor toll charges in one form or another on end party transactions, and (4) participation on a minor percentage basis in the savings from economy transactions between end parties. Arrangements of the power pool type are also a possible solution. Presumably, of course, any through use of the intermediate party's facilities will normally be junior in priority to the owner's use and will be so limited as to result in no impairment or jeopardy to service in the owner's system.

The intermediate party, if estimated to receive substantial direct benefits from the interconnection, should not expect or receive any large compensation for what is really a marginal by-product use of its facilities. To the extent the intermediate party's relation to the interconnection is predominantly that of a transmitting agent rather than a participant, and to the extent transmission capacity in its system is used up and must be made good in some other way, more substantial compensation is proper.

Ordinarily, the number of parties to an interconnection agreement should not exceed three, or at most four. As the number of active parties increases, settlements may become complicated and the effectiveness of operating cooperation may be impaired. Any of the participating parties can, however, have other interconnection arrangements with other systems, and usually such a situation does not result in serious complications.

Frequently, where the systems involved in an interconnection are large, they may severally have smaller satellite systems with which they are respectively interconnected. In such a situation, one of the main systems in its transactions under the major interconnection agreement may enter into commitments in respect of such matters as load diversity and reserve capacity as if its system in fact included the satellite systems; in which case it would then have its own separate arrangements with the satellite systems, which separate arrangements need not necessarily be related to or be in the same form as the arrangements between the parties to the major interconnection.

Interconnection Investment Arrangements

Most of the relatively inexpensive interconnections have already been made. Today a high capacity interconnection between major systems is likely to require substantial investment. The basis of apportionment of the interconnection investment, or of the carrying costs thereon, may be the most important problem in establishing a new interconnection.

Ordinarily, it will simplify future dealings to settle the investment problem once and for all at the start. If the situation has been thoroughly studied, a predetermined apportionment of this investment burden should involve only reasonable business risks. Devices may be set up for making the apportionment of carrying costs contingent upon conditions as they may exist from time to time in the future, but such devices should be subjected to rather skeptical scrutiny; their operation might be too uncertain and they might become such a source of dispute as to impair the benefits of interconnected operation. The proper objective as to apportionment of carrying costs is not to secure automatic proportionate equity as to the operations of any particular year or short period of years, but rather to protect the respective parties in making a long term investment. A long term investment should be made on the basis of an intelligent initial balancing of estimated cost against definitely predictable benefits plus reasonable allowance for other more speculative benefits, with due weight given to various possible hazards. Ex post facto readjustment may smack unduly of adjusting an insurance premium after risks have passed.

In two-party interconnections there will usually be a prima facie presumption that long term benefits from an interconnection will prove to be approximately equal. Hence, if it is not practicable to make the actual investment costs of the two parties approximately equal, a long term equalization charge should be incorporated in the interconnection agreement. If a definite probability is foreseen that additional interconnection investment will be needed later, initial provision should be made for this subsequent investment and for any appropriate readjustment of the equalization charge. Correspondingly, in interconnections involving three or more parties, if the investment cannot be assigned in proportion to the expected long-range benefits, long term equalization charges may be needed.

Where additional costs must be incurred to eliminate internal bottlenecks, the interconnection project should be charged only with that portion which does not represent an internal improvement which would soon be needed in any event.

Interconnection transactions are essentially increment transactions and should be analyzed and contracted for primarily on the basis of increment costs and increment benefits. Carrying charges on pre-existing investment, the other uses of which are not impaired, are not inherently proper charges against interconnection benefits. An attempt to assess any pro rata type of cost against interconnection transactions would be likely to blast the benefits at their source. This in fact is one of the considerations adverse to sliding-scale equalization charges; the effect of the sliding-scale equalization might tend to burden and hence prevent desirable types of transactions.

The incremental conception of interconnection transactions has other implications, in particular when a two-party interconnection is later expanded to include other parties, some consideration may be needed for the fact that the original parties had already secured part of the aggregate interconnection benefits.

Nothing has been said thus far as to the power pool method for investment costs. The power pool arrangement offers attractive possibilities under certain special conditions, particularly where more than two parties are involved and where operating economy aspects are a

main objective and appear to be sufficient to justify in themselves the necessary interconnection investment. The basic idea is that the pool is a quasi-independent agency for whose benefit interconnection investments are made and to whose account total economies achieved by interconnected operation are credited. After applying the aggregate savings to the carrying costs and upkeep of the interconnection facilities, any remaining net benefits would be distributed among the parties concerned. One reason for believing that such a power pool arrangement will not prove to be widely applicable to future situations is that not many major interconnection situations remain where the investments can with certainty be covered by operating economies alone. To be sure, the power pool conception might be expanded to include crediting to the pool not merely operating savings but also the savings resulting from reduced capital investment in generating facilities, although on this basis certain aspects of the settlements might become difficult and complicated. Fundamentally, much the same results as are achieved by power pool arrangements can be secured by investment equalization charges, split-saving settlements with respect to economy transactions, and direct apportionment between the parties concerned of savings in generating capacity.

In cases where an interconnection project involves initially a long-term power sale between the parties, it may be possible to meld any needed equalization charge into the charges for firm power in such manner that upon conclusion of the firm power transaction the parties are left in a relatively equitable position with respect to future interconnection transactions.

Possibly investment equalization charges should involve some tax adjustment feature. Under foreseeable conditions, up to 70 per cent of incremental income otherwise applicable to return on incremental investment may be absorbed in income and profits taxes.

FORM OF INTERCONNECTION AGREEMENT

Certain suggestions will now be presented as to a particular form which an interconnection agreement might take. This form is presented partly because it has proven useful in a number of situations and partly because it serves as a a vehicle for suggestions as to individual contract provisions applicable to any form of contract. No belief is entertained that the form presented is a panacea; on the contrary, the contract form for specific situations should be shaped around the principal transactions foreseen, and an attempt to adapt a standard contract form might well distort the relative importance of the actual transactions and impair the understandability and workability of the contractual arrangement.

This form of contractual agreement contemplates:

1. A long term basic Interconnection Agreement, which will provide for the interconnection facilities and will set up certain general terms and conditions applicable to all of the types of transactions which may take place from time to time throughout the basic contract period.
2. A series of Service Schedules, each applying to a single type of transaction and setting forth in sufficient detail the terms, conditions and arrangements applicable to that type of transaction. These service schedules would run severally for such periods as might be considered desirable, usually shorter than that of the basic Interconnection Agreement. The service schedules, when executed from time to time, would each become a part of the Interconnection Agreement for their respective periods. Service schedules covering the types of transactions expected in the immediate future would be agreed to initially and executed as parts of the basic Interconnection Agreement.

This general form of contractual arrangement offers a number of advantages: (1) different periods may readily be given to the arrangements for different types of transactions; (2) new service schedules can be added for new types of services, and service schedules for obsolete types of services dropped; (3) back-up service schedules may be included, to come into effect only in the event of termination of certain other service schedules without any substitutes having been agreed upon; (4) firm power transactions, either short-term or long-term, can be included from time to time as service schedules with their place in the composite service structure clearly defined; (5) ambiguity can be avoided in respect of whether contractual provisions applicable to one type of transaction are by inference applicable to another type; (6) when revisions are made in any service schedule, a new service schedule will be substituted and the working contract kept clean of obsolete material. Legally, of course, changes in a service schedule are changes in the interconnection agreement, but there may be important psychological differences; revision of a service schedule appears a less formidable proceeding than revision of a basic long-term contract, and there is less temptation to use the need for revision in some specific provisions as an excuse for wholesale tinkering with non-related provisions.

Basic Interconnection Agreement

The basic agreement would normally cover the following features:

Preamble—This would set forth, to the extent deemed pertinent, the circumstances and purposes out of which the contract has arisen. (Preambles can be overdone; they need not recite the life history of the parties, nor need they afford a preview of the contract provisions).

Period—The basic agreement should usually run for a minimum period sufficient to yield a reasonable amortization rate for the interconnection investment, such as 30 years, and should be cancellable after the minimum period on 2 or 2½ years' notice.

Facilities to Be Provided—Facilities to be constructed or made available primarily for interconnection use should be described and Junction Points designated. Additional facilities in the future, if any, should be described, and conditions determining their installation, mandatory or discretionary, should be set forth. There should be set up the obligation of the owner to maintain the facilities, or cause them to be maintained, in accordance with good practice.

Investment Equalization Charges — The amounts or the method of determining the amounts; adjustments for future changes in facilities; other adjustments. Possibly it should be provided that these charges run only for the minimum contract period, or that thereafter they be scaled down.

Priorities — In interconnections involving more than two parties, priorities may need to be established as to use of interconnection capacity. Ordinarily firm diversity transactions should rank first, two-party firm power transactions second, reserve and emergency transactions third, and economy transactions fourth. As to two-party transactions, in particular firm power sales, which utilize facilities of a third party, in certain situations the third party might need some limited veto power and might be entitled to some form of compensation.

Service conditions—Conditions for synchronized operation, avoidance of disturbances, balancing of inadvertent interchange when no transactions scheduled.

Metering — Standard general provisions applicable to all transactions, such as maintenance practice, testing, presence of representatives, corrections to billings for metering errors, etc. Provisions as to totalizing records at all junction points.

Uncontrollable Forces — Inability to perform not a default if beyond control and not avoidable by due foresight and provision of adequate reserve facilities. (This provision is desirable, even if initial service schedules contain no firm obligations, since it may be needed for future transactions.)

Operating Committee—Important feature. Operating Committee should be authorized agents as to operating arrangements for the transactions covered by the agreement. Should also be authorized to arrange for individual transactions not covered by service schedules, but continuing commitments should be limited to, say, 30 days. In elaborate interconnections should be authorized to employ Interconnection Manager. Functions by unanimous consent of representatives of parties concerned.

Arbitration—Probably desirable as something to fall back on as a last resort and possibly valuable in forestalling stalemates. Classes of subjects referable to arbitration should be clearly designated.

Standard provisions as to billings and pay-

ments, liability, jurisdiction of regulatory authorities, waivers, notices, etc.

Service Schedules—General

Each Service Schedule should cover the specific arrangements for the particular type of transactions within its scope. In particular, general metering layout and locations, ownership of metering equipment, nature of transmission loss adjustments, if any, should be covered, but details should be left to Operating Committee. Certain rules are needed for distinguishing between the types of energy involved in simultaneous transactions under different service schedules, but usually such rules can be left to the Operating Committee.

Where service schedules involve settlements based on incremental energy costs, the methods of establishing such costs should be a responsibility of the Operating Committee. Schedules of incremental costs for sources normally operated should be set up periodically *in advance*. Cost engineers should have opportunity to check incremental cost figures claimed by the other party, but emphatically there should be no need for formal audit by one party of the costs of the other.

Service Schedule for Load Diversity Interchange

Such a service schedule is needed where load diversity, and particularly schedulable diversity, is important. Minimum period should be fairly long, five or 10 years. In some cases it might run for period of basic agreement, unless superseded, with provision for *limited* review and revision in event of changed conditions, arbitration being available as a protection against stalemate.

Capacity saving from utilization of load diversity should usually be divided in proportion to the origin of the diversity, equally in two-party interconnections.

Since each party, in planning its power development program, needs to know the approximate amount of load diversity power it can count upon receiving, certain advance commitments are needed, procedures for which might be of the following character. A "service year" would be established, which would begin with that month in which the aggregate peak of the previous year is normally exceeded. "Scheduled load" of a system would be defined, annual and monthly, as the estimated maximum loads for the year or month less schedulable and casual diversity entitlements for the year or month, and, where applicable, plus schedulable diversity obligations. Load diversity for each service year would be estimated 2 to 2½ years in advance, and mutual firm commitments would then be made as to amounts of schedulable diversity power and of casual diversity power which each party is to be entitled to receive and obligated to deliver. As to schedulable diversity, such commitments could be in specific amounts for specific months and for specific periods of the day. Prior to each service year a diversity interchange program would be prepared embodying the commitments earlier made and setting up annual and monthly scheduled loads of each party. Rights to use schedulable diversity entitlements would be unqualified, or nearly so. Rights at any time to use casual diversity entitlements in addition might be dependent upon relation between the hour-to-hour actual loads and the scheduled loads of the respective systems.

The energy involved in load diversity transactions is ordinarily not large in amount since it flows only during short peak periods; hence, not much money is involved in settlements for it. It might be repaid in kind during heavy load periods in the receiving system, or might be paid for at a fixed rate per kilowatt-hour. Where full coordination is planned, settlement for load diversity energy might be on an economy interchange basis, or it might be based upon (1) the incremental cost of the most expensive source which the receiving system had in operation at the time, or (2) the incremental cost of the supplying party plus X per cent, whichever be the higher.

The casual load diversity, and the schedulable diversity also if relatively minor in amount, could be handled in a simpler manner not requiring a separate service schedule, which in many cases would be equitable and satisfactory. The probable amount of load diversity for each service year could be estimated in advance and taken into account in determining the amount of reserve capacity which should be provided, the aggregate reserve capacity being determined on the basis of aggregate loads after allowing for load diversity, and each system's share of reserve capacity, on whatever basis determined, being considered to be the capacity it should provide over and above its maximum load less its share of load diversity. The actual transactions utilizing the load diversity would then be treated as economy exchange transactions.

Service Schedules for Hydro Capacity Interchange

Interchange transactions (or special forms of sale transactions) intended to achieve savings in generating capacity in cases where one or both of the systems have predominantly hydro power sources, are usually too special in character to be a subject of generalized comment.

Diversity in stream-flow characteristics may be handled in much the same manner as load diversity, and might in fact be combined with it in one diversity service schedule.

Either party may be given the right to deliver energy for storage, at its own risk in case of spill, in otherwise empty reservoir capacity of the other party and to receive back on call an equivalent amount after incremental losses. Such storage service might be on a purely reciprocal basis without direct compensation, or a small toll may be charged, for illustration 0.25 mill.

Interchange transactions intended to increase the effective load-carrying capacity of low-load-factor peaking hydro plants may take several forms. An important factor in establishing the terms for such transactions is the fact that the hydro alone does not yield good capacity, it requires coordination with steam capacity or with high-load-factor hydro capacity; hence, the capacity gained by coordination is in part creditable to each party to the coordination.

Service Schedule for Reserve and Emergency Interchange

Since each system's capacity requirements are involved, the service schedule applicable to reserve and emergency service should not be cancellable on less than 2 or 2½ years' notice. If the initial reserve service schedule be of a full coordination type, a simple back-up service schedule might be desirable, or the initial schedule might be given a fairly long minimum period with provision for limited revision in event of changed conditions.

Where full coordination is not planned, the essential reserve and emergency provisions involved are merely (1) the right of one party to call for power, in case of trouble, in any amount up to what the other party is able to supply from otherwise unutilized power sources —either in its own generating stations or available from other interconnections, and (2) the obligation of the other party to supply power so called for to the extent practicable without impairing or jeopardizing service in its own system. Probably also there should be a designated amount of spinning reserve which each party agrees to have instantly available for the other at all times when conditions in its own system are normal.

This amount need *not* be the same each way if expected relative frequency of reserve calls is different. Possibly, as a partial protection against imposition, there should be a kilowatt-day charge for reserve and emergency service, which charge might be on a rising scale for disproportionate annual use by one party.

Where full coordination is planned, provisions are needed for reciprocal obligations with respect to maintenance of reserve capacity. These provisions might embody the following features:

(a) Establishment by Operating Committee, annually 2 to 2½ years in advance, of the aggregate installed reserve requirement for the interconnected group. To cover the contingency that for any period the Operating Committee may not have established this requirement, the requirement for the previous year might be carried forward, possibly with a small percentage added; or a back-up formula might be included, such as capacity of largest unit plus X per cent of aggregate load, or Y per cent of aggregate load, whichever be the greater.

(b) Establishment by the Operating Committee of some formula for aggregate spinning reserve to be maintained under various load conditions, with a similar back-up provision.

(c) Establishment by the Operating Committee of each system's proper proportion of the aggregate installed reserve requirement and of the aggregate spinning reserve under various load conditions, with some back-up provision to cover failure of the Operating Committee to act.

(d) If a party fail to provide its proportion of installed reserve, it shall be deemed automatically to be purchasing standby reserve from the other party or parties to the exent of the deficiency and for so long as it continues, the charge for such service to be $Z per kilowatt-month.

(e) If a party fail to provide its proportion of spinning reserve during any period, it shall be deemed automatically to be purchasing economy spinning reserve service from the other party or parties, either at some specified rate or on the terms for such service provided in the currently applicable service schedule.

Settlement for the energy associated with reserve and emergency service, ordinarily not a large amount, may be, at the option of the supplier in each instance, on any of the following bases:

(a) Subsequent return of an equivalent amount of energy under corresponding load conditions in the system which originally supplied the service, if this be practicable;

(b) Payment at X mills per kwhr;

(c) Payment at supplier's cost plus Y per cent.

Where general coordination of power supply is in effect, the preferable basis is the last of the above alternatives, and no option need be provided.

Service Schedule for Economy Interchange

The period of an economy interchange schedule need not be long, since it involves no capacity dependence and since the parties will usually at any time have equal inducement to have some arrangement in effect. Possibly such a service schedule might reasonably be cancellable at any time on one year notice.

There should be a contract right on the part of the would-be receiver to call for economy service, to the extent supplier's service is not impaired or jeopardized, but there should be no such right on the part of a would-be supplier.

Where full coordination is planned, the service schedule should specify the conditions under which a party is to be entitled to call for economy energy. They may be limited to conditions where such party has capacity available for immediate operation, or they may also include conditions where the party has capacity on a seasonal cold reserve basis. It is essential to the concept of economy interchange that the party calling for economy interchange could have supplied it from its own sources (otherwise it would have been reserve or emergency interchange).

The basis for settlement for economy interchange energy is preferably one embodying some form of the split-savings principle applied to individual transactions, possibly with a ceiling provision, for instance:

(a) Incremental cost to supplier of incremental energy required plus half of the difference between such cost and the incremental cost to the purchaser from its next most economical alternative, either by generation in its system or from some other interchange or purchase source, or

(b) Incremental cost of supplier plus X per cent thereof, if this be less than (a).

One reason for the ceiling would be to simplify cost accounting by having the X per cent low enough to avoid the need for computing incremental costs of standby and other sources not regularly operated.

Where one of the systems involved is predominantly hydro, *non-storable* hydro energy in a split-savings formula may be given an incremental cost of zero, or it may be given a small base value, probably not over 0.5 mill in most situations. Often in transactions involving *storable* hydro energy the terms must be left to agreement for individual transactions, since the value of storable hydro energy at a particular time may be anywhere between that of non-storable energy and that of energy from the best available steam capacity, depending upon the hazard of subsequently spilling, or having only dump use for, the energy stored.

In many cases it will be worth while to have an economy interchange service schedule include provision for interchange of spinning reserve service. Such interchange can be conducted on a split-savings basis similar to that in effect for energy.

Reasonable power-factor restrictions should be imposed on economy interchange service, or in lieu thereof, reactive kilovolt-amperes also may be put on a split-savings interchange basis.

Service Schedules for Firm Power

Service schedules covering firm power transactions would comprise the provisions usual in firm power contracts, except for the general provisions included in the basic Interchange Agreement. Short-term firm power sales, such as those incidental to rotating of power-station development or to other prearranged matching of a temporary surplus against a temporary deficiency, are often on a semi-incremental basis, and may take such special forms as sale of capacity without energy, the energy involved being covered under current interchange schedules.

Service Schedules for Secondary or Dump Power

Sale of a block of secondary or dump power at fixed rates, if any such transaction be planned, should be covered by its separate service schedule. This type of transaction may not be conducive to overall economy unless the fixed rates are low enough to afford the buyer an incentive to use as much as physically practicable.

CONCLUSIONS

A primary purpose of this paper, after developing the fundamental economic and strategic factors involved in potential interconnection situations, has been to indicate that analysis of these factors leads to the conclusion that diversity of ownership need not be a significant obstacle to interconnection of power systems and coordination of power supply.

The great power supply systems of this country have been created and developed by privately owned utility companies. The responsibility for power supply in this country today, in consequence, rests predominantly on private enterprises. The responsibility is growing and these private enterprises must grow, both to safeguard vital defense needs and to meet the expanding requirements of the future. The industry is in a stage when this inevitable growth must involve still further interconnections of power systems and increasingly greater coordination of power supply sources. This trend toward coordination does not

evidence merely a passing need created by the immediate and urgent demands of the defense emergency, it is inherent in the development of the industry. The conclusion is important, accordingly, that diversity of ownership is not an intrinsic obstacle to coordination of power supply and that construction and ownership of interconnection facilities lies within the natural field of private enterprise. Private enterprise should and will make the program its own.

Such a conclusion is indeed amply supported by what has already been done in the industry. Large-scale and thoroughly effective power coordination between independent systems was demonstrated to be successful a dozen years and more ago. But the conclusion is now stressed because of a possible feeling that examples of successful coordination represent a triumph over heavy handicaps. In fact, they succeeded primarily because the underlying conditions were inherently favorable to success.

In brief review, two basic considerations may be noted.

First, any investment in power facilities involves risks and no development program is fool-proof. This is equally true of a wholly internal project and of one involving cooperation with others. Rudimentary common sense should forbid imposing stricter standards of business rjsk on an interconnection project than on any other. Conditions underlying interconnection transactions include so much automatic incentive and so many aspects of inherent protection that no abnormal business risk need be incurred.

Second, physical interconnection of system and economic coordination in power supply involve no impairment or sacrifice of corporate or financial or managerial independence and no significant complication in managerial responsibility.

The principles out of which successful coordination develops are (1) sincerity on one's own side coupled with confidence in the integrity of the other side, (2) contractual and working procedures sufficiently definite to get things done and sufficiently flexible to meet changing conditions, and (3) courage to face new ways of doing things and to seek new levels of industry effectiveness. On this basis, the privately owned utility systems in this nation may continue their creative progress in the future, as in the past.

The President's Address

(*Continued from page 225*)

were members. Even before the recent resignations, the Institute membership represented only about 2/3 of the gross earnings of the industry. It is to be hoped that, in the light of the official assurances that have been received, those members who have resigned will re-enter our ranks (as, indeed, two have already done) and that others, who have not been members, will also cooperate by joining in our common effort.

Statistical Summary

The Institute has just brought out its eighth statistical bulletin, enlarged and much improved in form compared to previous years. I commend it for careful study by those who for any reason may have become discouraged about our industry. Let me give a few of the high-spots it shows about 1940.

We gained 1,086,000 customers in the year, the total now being well over 30,000,000.

Farm customers now number 2,000,000, with 200,000 gained during the year.

The peak load grew over 7½ per cent in the year to over 30,500,000 kw but the rated generating capacity is over 30 per cent greater.

Sales of all but two of the nine principal household electrical appliances were larger in 1940 than in any year in our history. Even the humble electric iron showed a score of over 5,000,000 for the year. Refrigerator sales in the first quarter of 1941 ran 50 per cent ahead of the same period last year. To reach this peak of achievement, after nearly 60 years of active life, shows us to be an active and virile industry.

Taxes, in per cent of gross, also hit a new high in 1940 but that is a condition common to all industry.

Conclusion

In closing, I prefer to dwell upon our accomplishments and hopes rather than upon our discouragements and difficulties, serious as many of these are. As an industry we have always had troubles; but we have become great through overcoming them. We have the satisfaction of knowing that we have built up in this country the greatest development of electricity the world has ever seen; and of realizing that, through the facilities and organized man power we have thus assembled, this continent should be better able to defend itself from outside domination than any area on the globe. Most of us have grown up in this industry. We know what it has taken to develop it to its present state of usefulness to the people and to the nation—namely, the constant maintenance of the highest standards of efficiency and devotion to the public service. If we will but think of the obstacles and hardships overcome by the pioneers in our industry, when they had no background of past achievement but only faith in the future and determination to succeed, we shall be inspired to carry forward, with enthusiasm and courage, the great traditions of public service they have bequeathed to us.

Industry and National Defense

(*Continued from page 236*)

of the National Association of Manufacturers to William S. Knudsen, director of the Office of Production Management.

This is the pledge of American industry:

"We pledge to you and the American people for whom you act, the continuing devotion of our utmost energies in the production of the materials of defense. We pledge every spark of ingenuity we have to the gigantic task of making America's superiority in forging weapons of defense as distinctive as has been its superiority in the mass production of the essentials and luxuries of peacetime living. We pledge ourselves to place patriotism above personal gains; to recognize that profiteering would constitute a breach in the moral contract which industry has signed with the American people for the production of their defense demands. We pledge ourselves to unremitting efforts to maintain a policy of price stability insofar as that control lies within industry. We pledge fairness to labor and every effort consistent with our responsibilities to avoid the stoppage of vital defense production. We pledge ourselves, except where defense demands create a prior obligation upon us, to maintain the fullest possible production of the goods essential to the maintenance of this country's traditionally high standard of living. Given the efficiency of free industry and the cooperation of free workmen and our free government, we can and will make America invincible."

Therefore, all people of industry . . . worker and manager alike . . . have combined to provide the means of defense to protect this great land of ours against any eventuality. There will be no allegiance . . . whether it be political, social, or economic . . . to swerve us from our course. We stand indivisible and united in our solemn purpose (come what may!) to answer the call of our government and re-dedicate ourselves to the protection of our people against any aggression either from within or from without. We will continue to follow the counsel of the now immortal Lincoln who, in an earlier American emergency, had this to say: "If we do not make common cause to save the good old ship of the Union on this voyage, nobody will have a chance to pilot her on another voyage."

What Has Been Happening in Load and Capacity

By Col. H. S. Bennion

Vice President and Managing Director, Edison Electric Institute, New York, N. Y.

Address before the Fourth General Session of the Ninth Annual Convention of the Edison Electric Institute, Buffalo, N. Y., June 5, 1941.

AMERICA, slow to begin rearming measures when war minded nations were arming themselves, a year ago began to make appropriations of unprecedented magnitude for rearmament and for the provision of camp and training facilities for military and naval forces. The speed and degree of expansion is indicated by the following figures.

Rearmament appropriations for the fiscal year ending June 30, 1940, totaled $1,785,000,000. Beginning in June, 1940, a continuous series of appropriations, supplemental and deficiency appropriations have been passed by Congress, which by May 17, 1941, had amounted to $37,871,000,000, of which amount $13,100,000,000 was for the Army, $13,100,000,000 for the Navy, $4,100,000,000 for miscellaneous government agencies on behalf of national defense, and a $7,000,000,000 lease-lend bill on top of all.

Contracts actually let and expenditures already made were reported to have reached $15,200,000,000 up to May 1, 1941.

Reports of the Treasury Department and of the Bureau of the Budget show that rearmament expenditures for the Army and Navy for the entire fiscal year ending June 30, 1940, amounted to $1,559,000,000. For the six months ending December 31, 1940, these expenditures were $1,750,000,000. For the six months ending June 30, 1941, these expenditures are expected to reach $4,750,000,000, and the Secretary of the Treasury recently stated that for the entire fiscal year ending June 30, 1942, they would amount to $12,000,000,000. This estimate has now been raised to $15,500,000,000 by the Bureau of the Budget.

This huge government spending, without the depressing influences of participation in actual war, and coupled with purchases by foreign governments, has created boom times with their usual stimulation of industry and business superimposing their power demands on top of the demand pertaining strictly to rearmament operations.

COL. BENNION

Another factor, materially influencing the power demand on generating stations, has been the enactment in recent years of national laws operating to establish the habit of short work weeks. Prior to this emergency, the War Department's Industrial Mobilization Plan contemplated three-shift, full-week operation for industrial plants. Less than a month ago the press reported that Sidney Hillman, Associate Director General of the Office of Production Management, was working on plans for placing some defense industries on a four-shift, 160-hour-a-week basis. Three weeks ago the Assistant Secretary of War stated, "We have asked industry to work on a 24-hour basis to the degree that men, materials and machine tools are available. If there were a 25-hour and an 8-day week we could use these too." But habits are not easily shaken off, and a survey for December, 1940, by the Bureau of Labor Statistics revealed that out of 394 factories, employing about half a million men, more than 50 per cent were working five to five and a half days a week, and 75 per cent of all the employees were on the daytime shift. Electricity output figures since December, however, indicate some more lengthening of the hours of weekly plant operation in recent months in the industrial areas.

The heavy spending of the rearmament program, notwithstanding the enormous productive capacity of this country for normal purposes, has resulted in the taxing and, in some instances over-taxing, of industrial stores and productive capacity, with the consequent introduction of priorities to determine precedence of manufacture and delivery of products needed by the war machine as well as control and rationing of civilian requirements. Since a priority system upsets the economic law of supply and demand, the next step has been the establishment of a broad control of prices. The Office of Price Administration and Civilian Supply, on a parity with the Office of Production Management, was established by Executive Order in April of this year, with specific duties to prevent price spiraling, rise in cost of living, profiteering and inflation resulting from emergency conditions and to stimulate the provision of the necessary supply of materials and commodities required for civilian use after meeting military defense needs.

The basic views of the new Price Administrator, Mr. Leon Henderson, have been extensively reported and analyzed in the press. They seem to be two-fold.

1. To put a stopper on prices, especially of key raw materials which threaten for any cause to get out of line.
2. To blast any bottlenecks to production whenever and wherever they may arise and stimulate increase in industrial capacity to avoid the development of bottlenecks.

These two objectives of the Price Administrator are of great importance to the American people and to American industry. If successfully applied they can be of great value to the country, both in the present and in the post emergency period. How well these objectives conform to the past and present performance of the electric utilities will, I believe, be clearly evident from the charts now to be shown depicting the price and growth history of electric service in America.

Chart 1 shows the price history of domestic service of the past quarter of a century and, to throw light on the conditions under which this price record has been achieved, shows also the cost of living index over the same period. Surely this price record meets the first objective of the Price Administrator.

Chart 2 shows the price history of retail commercial sales of the past fifteen years.

Chart 3 shows the price history of industrial power sales of the past fifteen years. This price rises slightly in depression years, but the general trend is decidedly downward.

Chart 4 shows the domestic service price history contrasted with the upward climb of three important cost elements entering into it which are beyond, or largely beyond, the control of utility management—taxes, fuel prices, hourly wage rates. The cost of domestic service is down 56 per cent, fuel is up 75 per cent, hourly wages up 215 per cent, and taxes up 268 per cent since 1913.

Chart 5 shows the expanding growth of output of the electric light and power industry in the past quarter century. Surely this record meets the second objective of the Price Administrator.

Chart 6 shows the estimated total output of electric power by both the power industry and isolated industrial plants.

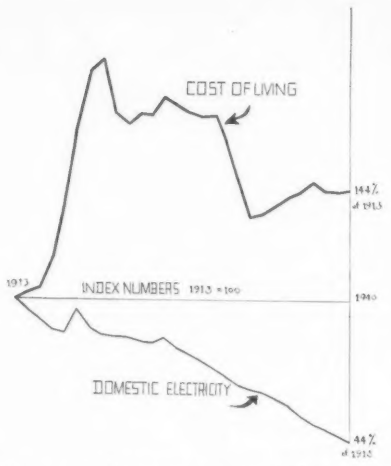


Chart 1—Domestic Electric Service—Cost of Living

The expansion has taken place in the utility field.

Chart 7 shows the total electric output in the United States over the past twenty years compared with that for Japan, Great Britain and Germany to the extent that information is available.

Chart 8 shows the expansion of power during the past quarter of a century contrasted with the growth of population, of industrial production and of transportation. Electric power expansion is still well in the vanguard.

Chart 9 shows the growth of residential consumption of electricity compared with the consumption of motor fuel in passenger cars and trucks during the past quarter century.

Chart 10 shows the total installed capacity of all generating plants contributing to the public supply and shows the sum of the non-coincident peak demands over the same period. It will be observed that 1938 was a year of reduced industrial activity. The outbreak of war in Europe in 1939 caused a jump in the peak demand amounting for the entire country to about 3,600,000 kilowatts. Greater prosperity and the incidence of additional war loads in 1940 increased the sum of non-coincident peak demands another 2,200,000 kilowatts. Estimates of individual utility companies made in February indicate an increase of another 2¾ million kilowatts in the sum of non-coincident peak demands by December, 1941.

On the chart is also shown the estimated additions to total installed capacity contributing to the public power supply as indicated by reports and announcements of electric utilities, municipal and district plants and Federal Government projects. In addition to the foregoing, industrial plants themselves will install more than 675,000 kilowatts of industrial steam capacity in 1941. The 1941 installations by the electric utilities themselves amount to approximately 2,100,000 kilowatts and in 1942

Chart 2—Retail Commercial Sales—Price History

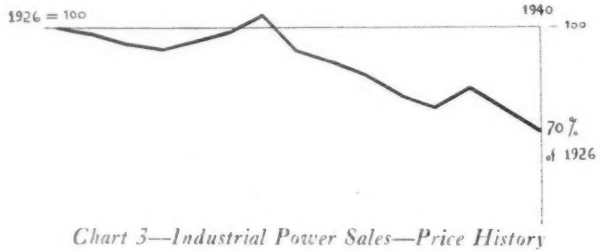


Chart 3—Industrial Power Sales—Price History

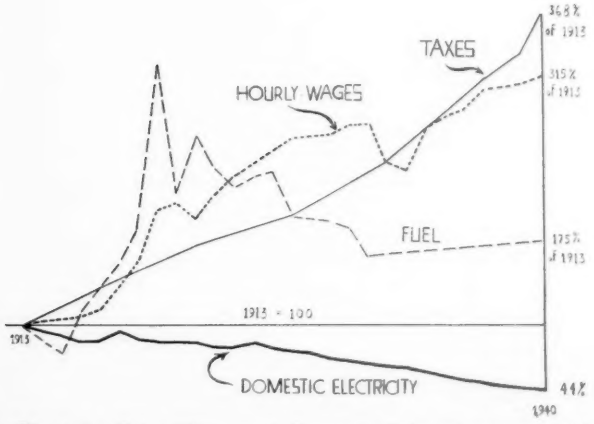


Chart 4—Price History of Domestic Sales Compared with Three Important Cost Elements

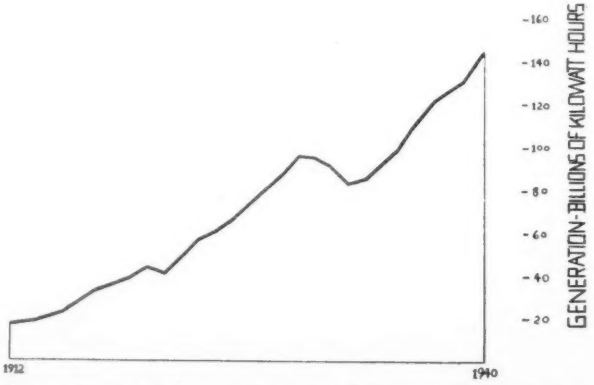


Chart 5—Total Output—Electric Light and Power Industry of the United States

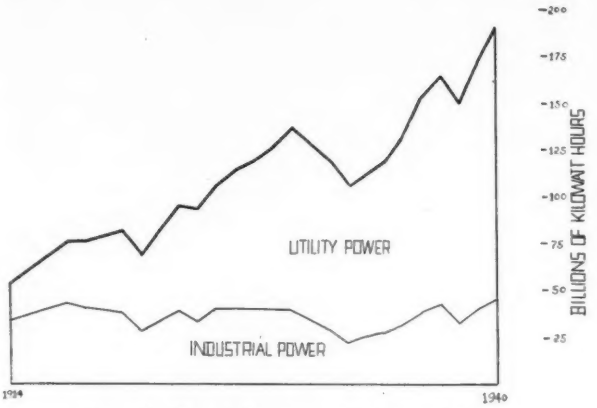


Chart 6—Total Output—All Prime Movers

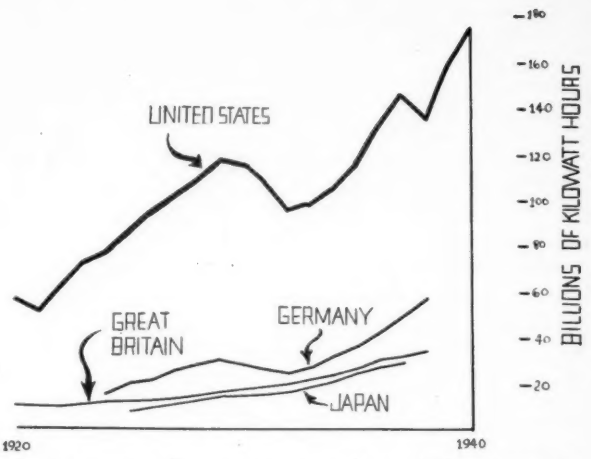


Chart 7—Total Electric Output in U. S. A. Compared with Three Foreign Countries

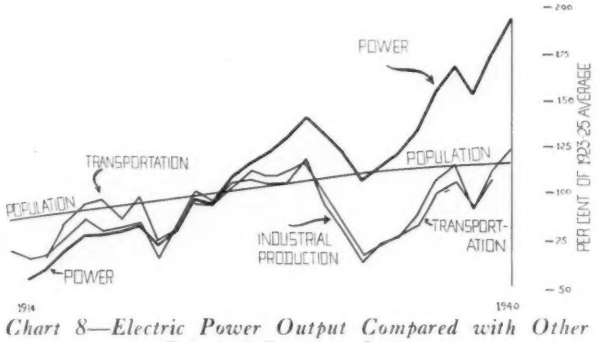


Chart 8—Electric Power Output Compared with Other Principal Economic Indices

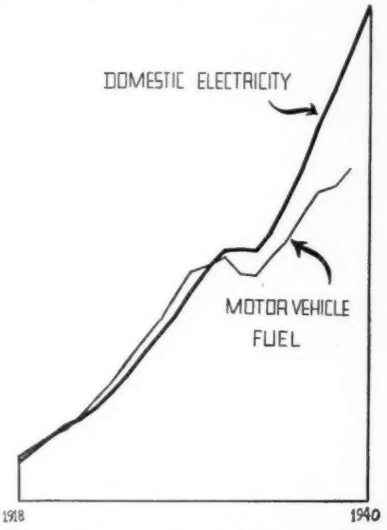


Chart 9—Growth of Domestic Electricity Sales Compared with Motor Fuel Consumption

approximately 2,500,000 kilowatts. Already announcements of capacity to be installed in 1943 amount to 1,045,000 kilowatts. The bulk of this capacity is steam power to be located in the heavy industrial areas east of the Mississippi and north of the Ohio and the Potomac.

Chart 11 shows the trend of installed capacity and of peak loads during recent months. This picture is reassuring.

Chart 12 indicates the behavior of load factor during the past two years. There has been some little improvement. This is more pronounced since the first of the year. It indicates that factories are working more shifts, but the improvement is short of expectations.

Chart 13 shows the growth in mileage of power lines 33,000 kilovolts and over since 1918. This simple curve tells a story of enormous expansion. In the settled regions and even in the rather sparsely settled regions of this country, few spots are very far removed from a power line with substantial capacity. This expansion, costing hundreds of millions of dollars, has been a large factor in the development of the hinterlands of America. It has proven of immense value to the present rearmament program and as that program intensifies its value must rise proportionately. Much of this transmission line development took place ten to twenty years ago. It was planned, financed and accomplished by private capital.

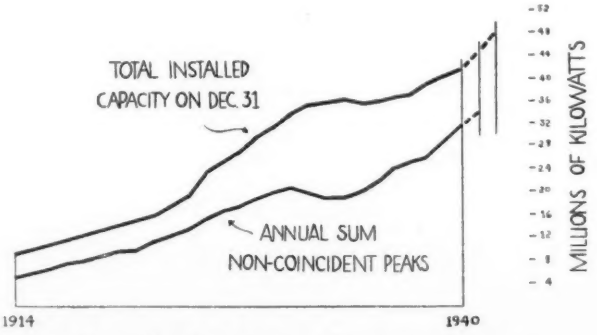


Chart 10—Peak Loads—Generating Capacity

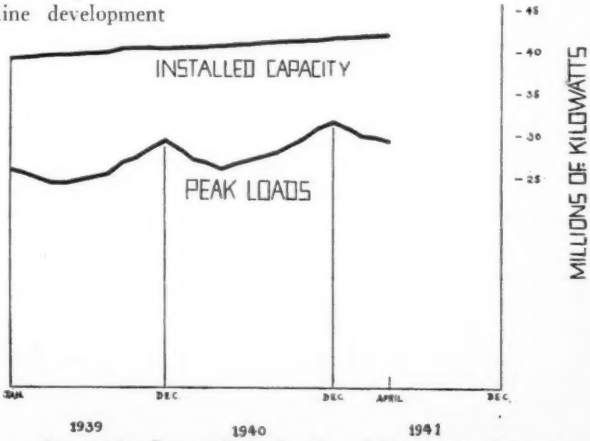


Chart 11—Recent Peak Loads—A Reassuring Picture

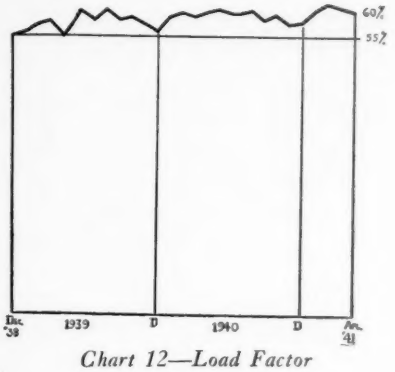


Chart 12—Load Factor

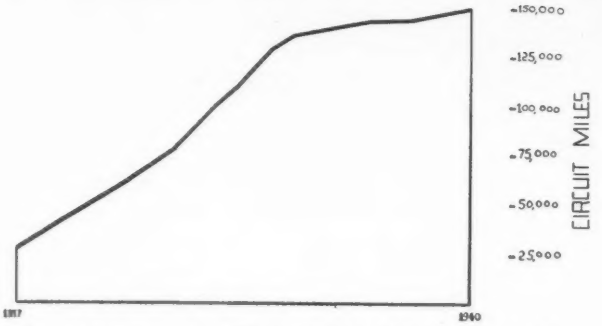


Chart 13—Growth of Transmission Lines—33 kv and over

The charts shown are useful to give a general picture of the load and capacity situation. They indicate the order of magnitude of the various factors and give a reasonably good measure of the trend of developments. Beyond that they have little value. It is not possible by statistics to give a true measure of the engineering and operating factors pertaining to the load and ability to supply it in any particular territory or group of areas. In the first place, to collect and compile statistical data, it is necessary to set up assumed limits and definitions which fit only roughly any one area for any length of time. For example, it may be specified for a statistical report that the capacity of all generators shall be reported according to the nameplate rating placed upon such machines by their manufacturers. The true capacity of any generator is what the operating crew can get out of it under differing conditions of operation, not what is stamped on a brass plate. On this point I recommend the careful rereading and study of a paper entitled "Firm Ratings as a Guide to System Loading and Design," delivered by S. M. Dean of The Detroit Edison Company at our annual convention in St. Louis, June, 1936, and reported in the E.E.I. BULLETIN for that month. It sets forth information gained from tests and experiments which are of great value to engineering and operating forces, particularly so at the present time.

Another engineering relationship that is too complicated for statistics is the capacity and output to be expected from hydro plants used alone or more particularly when used in conjunction with steam stations. In order to make a statistical tabulation of these factors, limiting conditions must be assumed. This usually means that capacity is put down at the figure that would prevail for a two to four month period during a record dry year. Such a time seems to be developing in two or more areas now. In practice when drouth conditions are encountered, however, other reserves, interconnections and special methods of operation or rearrangement of loads are always worked out to meet the situation. There is a flexibility in actual operation which cannot be reflected in statistical tabulations, and, while the effects of drouth on power supply loom large at the time, in retrospect the net effect on the year's power output shows up relatively small.

Next there is the question of reserves and the amount of spare capacity which should be carried. The necessary reserve under normal conditions hinges upon many factors—for instance, upon the size of the largest generator which might be out of service on a given system at any one time, whether due to breakdown or overhauling or repairs; or upon the need to run certain units to get a particular quality of local service; or upon conditions in neighboring systems, such as the status of their reservoirs, of their fuel supplies; or upon the characteristics of loads being served at a particular time of the day, week or season. Here again rule of thumb formulae have some usefulness. They afford broad and general guides for particular and general purposes, but that is as far as they can go. The element of skill, of experience, of judgment, controls. Power plants and transmission systems of the industry are run by competent, loyal, experienced, skilled forces of operators, whose ability to turn out the power has not failed in the hour of need. The experience and resources of the organization operating a power system may be a bigger factor in the resulting service from it than the extent and condition of the reserves. Reports from the bombed areas of England bear out this observation.

One other point about reserves should be noted. The amount of reserves which are provided for ordinary peace time operations, affording a high degree of reliability as a safeguard to the public convenience, may not be vital or appropriate for extraordinary and relatively short-lived conditions. Most people in the management of their own affairs get along with some inconvenience and makeshift during relatively short emergency periods in preference to heavy outlays to safeguard their convenience in such rare periods. The United States uses the National Guard, created for state protection, as a reserve of the Regular Army in peace times, but it certainly puts the Guard into active service in war time, and the states get along in other ways for local protection. A skillful general counts on throwing into the battle at the critical moment all of his reserves including the technical troops. After all, the thing that will determine the success of the rearmament program is the sustained industrial production which is put out over a period of time. Interruptions of an hour or even of a week or a month as to some few thousand kilowatts of capacity may be annoying or inconvenient, but it is not going to win or lose any wars. Its influence can but be trifling compared with other causes of delayed production.

Further, in trying to size up aggregate available electric capacity in any area, there is still another big factor which makes even the best statistics on capacity of limited value unless skillfully interpreted. This factor arises out of the enormous extent to which interconnections exist between power stations. Unless the entire country be taken as a single area, any attempt to determine capacity by regions will necessarily omit interregional capacity possibilities. Once more the answer is that judgment and experience determine what capacity can be secured in a particular area, especially so in emergencies. In practice

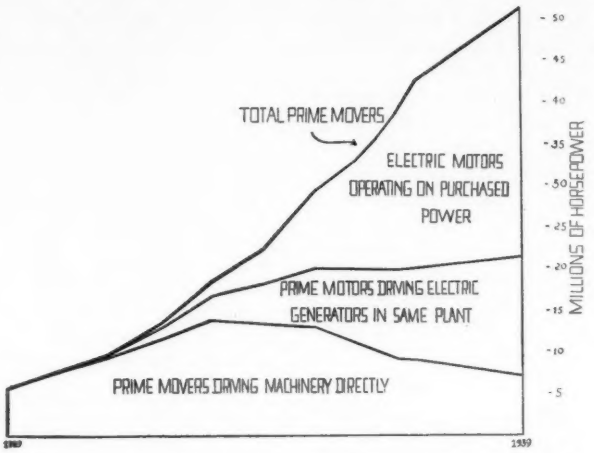


Chart 14—Total Mechanical Power used by Factories in America

emergencies have been met and overcome. That is the advantage of having competent personnel on the job. It is a job which has been and will be carried out with the necessary flexibility to meet load and power supply conditions from day to day, from season to season and from year to year.

Utility Industry's Responsibility

From the standpoint of cost and convenience, electric utilities have a monopoly of the power supply for the domestic and small commercial business and have assumed a continuing responsibility to supply such loads. They have won a large share of the business of large commercial and large industrial concerns, but because they have only a part of that business it follows that they have only a partial responsibility for supplying that class of load. Analysis of the sources of power made use of by different classes of industry shows that electric utilities have about 60 per cent of the responsibility for supplying power to the great steel industry and less than half of the responsibility for supplying power to the chemical industry. It happens that the sharpest rises in power demand produced by the war effort have been in this latter industry. This is especially true for the production of aluminum and magnesium and to a lesser extent of explosives.

In certain sections of the country large Federal power projects, constructed in recent years, have assumed an important share of the responsibility for supplying the increased power needs of those regions. This is particularly true in the Tennessee Valley, to some extent in Texas and southern California and in the Pacific Northwest, and it is to the Tennessee and Columbia Valley areas that the big new aluminum power loads have largely gravitated. The uncertainties arising from the intrusion of Federal projects into these areas, in fact, rendered it most difficult for electric utilities, in adjoining areas, to make advance provision of additional generating capacity with which to supply the greatly increased loads which have sprung up as a result directly and indirectly of the rearmament program.

Chart 14 shows the total mechanical power used by factories in America. The non-mechanical uses for the production of aluminum, chemicals, electric heat treating, etc., are not included. It will be observed that in 1914 the responsibility of the electric light and power industry was only 17 per cent of the total; in 1919 it was 32 per cent of the total, and in 1939 it had risen to 58 per cent.

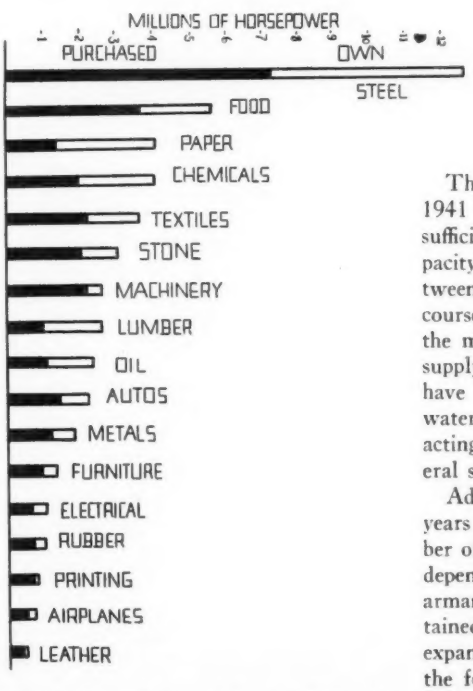


Chart 15—Division of Responsibility for Mechanical Power by Classes of Industry

Electric generating capacity added by industrial plants themselves in 1940 was approximately 450,000 kilowatts and in 1941 they will add more than 675,000 kilowatts of steam capacity. The addition for 1941 is approximately 35 per cent of the amount to be added by electric utilities during the same period. Up to May 15th, about 75,000 kilowatts are scheduled to be installed by industrial plants in 1942.

Chart 15 shows the division of responsibility for mechanical power by classes of industry. It will be observed that the electric utilities have about half the responsibility with respect to iron and steel and chemical products. If non-mechanical power were included this share would be still less.

Obviously, an electric utility's first responsibility for taking care of present, and reasonably probable increased power demands is to the customers to serve which it has been built and maintained. Its responsibility to serve large industry war loads, as pointed out before, is shared by the various industries themselves, because many of them have habitually supplied all or part of their own power requirements.

Future Adequacy

The large installation program for 1941 and 1942 is generally considered sufficient to assure adequate power capacity to meet increased demands between now and the end of 1942. Of course, there will be some spots where the munitions loads will tax the power supply facilities. The weather man will have something to say about this in water power areas, and he has not been acting favorably so far this year in several sections of the country.

Adequacy in 1943 and succeeding years will, of course, depend on a number of factors. On the one hand, it will depend on still further expansion of the armament program, and the speed maintained in actual production; and further expansion, in turn, is largely based upon the foreign policy this country may decide upon. On the other hand, to balance or offset the increased power demand by reason of further program

expansion, there will be the additional generating capacity installed subsequent to 1942 to meet the estimated growth of demand. Already the private utilities have announced plans for 827,000 kilowatts in 1943 and municipal and government power projects bring this total to 1,045,000 kilowatts. The installation of 670,000 kilowatts of generating capacity is already scheduled for 1944. On this same side of the balance are factors which will exercise some compensating reduction on the overall power demand. These factors are: the taking out of the ranks of industry of additional manpower to fill the ranks of the armed forces; the curtailment of production for civilian supply because of taxation and other factors which will reduce buying power, and because of priorities and other controls on such supply; then there may be other causes of reduced or delayed production such as strikes, the lack of ocean shipping facilities, limited supplies of some materials, etc. Furthermore, the working of munitions plants more days in the week and longer hours in the day will serve to hold down the growth of demand. There has already been some improvement in this regard in recent months. Another helpful factor can be the shifting of loads, particularly loads of heavy demand characteristics, to offpeak hours of the day and week.

Some of the growth of demand that already has been experienced is nonrecurrent. This is true of the starting up and speeding up of operations of factories which in the summer of 1939 were idle or were running at part capacity. Much of the construction program is now completed or shortly will be so, and the power consumption for that construction, or for the producing, fabricating and hauling of those construction materials is over with. The expansion history of the past twelve months, however, shows the importance of watching closely the course of our foreign policy and of making some allowance for the unexpected. Business nowadays is determined by government plans. The usual business criteria are submerged.

When Will the Peak Demand be Reached?

In a broadcast dated October 10, 1940, Mr. William S. Knudsen, then in charge of the Production Division of the National Defense Advisory Commission, stated: "I expect that employment will reach its peak in July, 1941." In an Army Day address on April 6, 1941, Mr. Knudsen said: "With the American defense program instituted in June, it was possible to place over twelve billion dollars' worth of contracts promptly, Congress giving final authority in early September, so that we have placed today practically all the equipment required for one million two hundred thousand men and heavy equipment—meaning guns, tanks and planes —for eight hundred thousand additional. This we hope to have finished by the end of 1942. The additional load caused by the lease-lend bill and the British orders still unfilled adds 60 per cent to the total, so that we are faced with a production job, the approximate size of which is twenty-eight billion man-hours, to do in twenty-seven months." Twenty-seven months from April 1, 1941, will be July 1, 1943. Referring to Mr. Knudsen's estimate of a 60 per cent rise due to the lease-lend bill, the aluminum and airplane production program, according to reports, is being stepped up in about that proportion.

Mr. Knudsen's announcement two weeks ago of the new bomber program stated that it was hoped to increase the output of heavy bombers to 500 a month by the fall of 1942.

Mr. John D. Biggers, Director of Production, Office of Production Management, speaking before a committee of Congress on April 7, 1941, said that America was "just about 100 days from the beginnings of real mass production of many vital items." One hundred days from April 7th is the middle of July. In a speech before the U. S. Chamber of Commerce, April 30, 1941, Mr. Biggers said, "Before this year of 1941 ends, the monthly production of powder—big as it now is—must and will again be trebled. Small arms munitions must and will be trebled. Rifle production must be doubled. Machine gun production increased five-fold. Tank production quadrupled. . . . Tremendous efforts have been planned and in my opinion will be accomplished."

Forehanded Steps the Utilities Can Take

While the statements of those directing the huge armament program would indicate that the peak demand will come before the end of 1942, nevertheless we must recall how greatly the program has been expanded in the past several months and therefore should keep an alert watch for evidences of any further expansion and plan construction accordingly. As pointed out before, business now is mostly determined by government plans. In addition to keeping this sharp lookout, it is suggested that the following four steps, which many companies are following, can profitably be taken by all.

(1) Study carefully industrial loads and means to shift them around the clock so as to produce improvement in load factor. A number of companies working at this have accomplished remarkable load factor improvement. And remember that any saving in maximum demand on system capacity is equivalent to installing just that much additional capacity, and that the benefit of this accomplishment will extend far into the post emergency period.

(2) Restudy generating plant, transmission and distribution facilities, not from the standpoint of furnishing high quality service which utilities habitually strive to give their customers, but from the standpoint of what each part of the system can be forced to do if necessary to get the most out of the plant. The past operating history of this industry affords many examples of achievement in working plant to the limit. In general, recent years have not taxed the ingenuity of operating forces on that score, but if the occasion once more should require it, most certainly they will rise above its demands as they have done again and again in the past.

(3) Keep well posted on load and capacity conditions in all neighboring territory to make additional interconnections as they may become useful in helping to assure an adequate power supply in all places and situations in and near the territory your company is serving.

(4) Reexamine the several component loads which contribute to the system peak load from the standpoint of their importance to the national defense, with a view to determining in your own mind the order in which such loads could be curtailed, if real need should arise in the future, and the sensible method of accomplishing it. This proposal may sound remote and superfluous, except perhaps for a time in the water power areas affected by severe drouth, but it should be remembered that this is a period when business and people are confronted with the possible imposition of restrictions in many ways affecting their lives and affairs; and, in spite of the general adequacy of power supply so far as can now be seen, it would be foolish to disregard the possibility of restrictions affecting electric service also. The OPM is pointing out that mass production will begin in earnest next month. This means the rapid consump-

(*Continued on page 272*)

The Responsibility of Sales in These Changing and Critical Times

By R. E. Fisher

Vice President, Pacific Gas and Electric Co., San Francisco, Cal., and Chairman, General Sales Committee, Edison Electric Institute

Address before the Third General Session of the Ninth Annual Convention of the Edison Electric Institute, Buffalo, N. Y., June 4, 1941

WHAT'S ahead for the electric industry is synonymous with what's ahead for America. America's No. 1 job today is National Defense. However, as increasing supplies roll out of factory doors, important and sober thought is being given to the future. All industry is confronted with some dislocation and much uncertainty. American industry must meet the challenge of the times. In addition to whatever abnormal jobs we are called upon to do we must also carry on as best we can to serve our regular markets and to develop new ones. We must work at top speed to manufacture armament, but this time we are equally determined not to neglect our normal market for upon that market depends our future existence.

Future peace-time markets can be safeguarded only by sustained or intensified sales effort, continued advertising, and maintaining the best service policy commensurate with war conditions. Only thus can we cushion the economic blows another armistice inevitably will bring.

A sound economy is as vital as a sound military defense. The great mass of people must be kept on working, earning and buying. If business is to bear the heavier tax burden imposed upon it by the preparedness program, we've got to have good business in the most literal sense of the word. That is essential, both from the standpoint of business itself and of the national morale.

The Nation's income in 1940 rose to about $75,000,000,000. It is estimated it will exceed $82,000,000,000 in 1941. Our Federal Government says we cannot be satisfied with a national income of less than eighty billion dollars and fiscal experts predicted that in the next decade it ought to rise to more than one hundred billion dollars a year.

MR. FISHER

The effect on industry of a national income of one hundred billion dollars or more per year has been studied and estimated by the National Resources Committee and is revealed in their confidential publication entitled "Patterns of Resources Use." In this study a number of projections are made. However, like most pure theory the economic assumptions and correlations end in statistical frustration. One prediction, for example, is that if the desired national income is attained, automobile output would be thirteen million vehicles per year as compared with four and one-half million in 1940. Leading economists and statisticians challenge these "patterns." They contend that no one can project economic trends in the future based on records of the past and say with assurance what people would buy if they had greater income with which to buy. The kinds of goods bought in previous years will not be a reliable guide to demands in future years.

The effect of sustained customer acceptance and far-sighted market development through sales and advertising programs, has time and again proved the principle that production automatically flows into those goods and services which people "vote for" when they spend their dollars in the market place.

Our industry must realize that the expanded activity in every line of industry due to the National Defense program will produce only an illusion of greater prosperity,—not an economically sound, lasting prosperity. A war-time economy cannot be measured with a peace-time "yardstick." Neither must we be fooled into thinking that a given war-time national income would mean the production of similar goods or retention of the same high standard of living characteristic of an equivalent peace-time national income. The two situations are not comparable—industrially, economically or psychologically.

Business men who lessen their sales efforts because they are in a seller's market are not building for the future. Momentum must be maintained so that when defense work slackens the impetus will have been provided for expansion of normal activities to take up that slack. Unless business disciplines itself to a policy of long-range market development and sales work, we shall once again be caught as unprepared for peace as we found ourselves unprepared for war. While we are shouldering defense responsibilities, we must, therefore, sustain our selling program to keep our product in the public eye so we will not lose place, position or identity,—the essentials to continued successful operation. This year's customer is not necessarily a customer two years from now. We've got to keep him that way!

These "come-and-get-the-order" days create a situation which extends throughout all industry. It is something that has to be—we couldn't stop it if we wanted to, and we don't want to because it is the only way we can do our

part in the defense program. Nevertheless, during this forced draft seller's market we must face the facts and prepare for the future. Business building and customer holding tools will be sharpened now by the far-sighted executive. The less wise and the short-sighted will let these tools rust simply because the job of the moment perhaps can be done without them. There is still a selling job to do. Everyone knows that the activity re-armament has created will not last forever. The period that follows re-armament must not be one of decline in industrial activity and employment if we expect to side-step a depression worse than any seen heretofore.

The London *Times* recently published a booklet which was printed while bombs were falling around the office of the Times Building. This booklet begins by stressing that "while certain changes have been brought about by the war, no one can say fundamental economic laws change." The *Times* then goes on to say, and I quote:—"because the public has been asked to make great sacrifices, the people are entitled to know that everything possible is being done to sell and advertise British goods in overseas markets. Those few great industries or businesses which have ceased to advertise for more than a year may well ask themselves what the end will be. For a good many of them there is even now some business to be done with part of their production. There are services to be rendered which will help carry the people of this country through their present ordeal. Beyond this ordeal, however long it may last, lies a period of reconstruction. No business man even now should neglect what is necessary to keep his place open in the new world that is to come."

If a great newspaper in London feels it necessary, even in the midst of Britain's battle for survival to warn the British people, how much more essential it is for us in this country to keep our eyes on the ball and realize that a curtailment of selling and market development is one of the surest ways ultimately to destroy our national wealth.

The challenge confronting the electric industry today is load building with emphasis on fuller use of existing facilities. The electric utilities have a use factor that is still below 40 per cent. If the valleys of our load curve can be filled, the present generating capacity can comfortably furnish many more kilowatt-hours without danger of shortage. We point with pride to the engineers of the electric industry who have made it technically possible to give our customers more and more for less and less. While such progress has been made in production, transmission and distribution efficiencies during the past two decades, the trends definitely indicate that further gains in technical efficiency will be less and more difficult of achievement. Notwithstanding the contribution of our engineers, they are now challenged to build and operate systems which must compete profitably with tax-free and Federally-subsidized Government systems. Another challenge confronting the utility industry is an aroused public opinion that demands a rate ceiling so low that net revenues are constantly threatened. Simultaneously, our industry is confronted with new light sources of high efficiency, new appliances and new processes, all of which hazard a threat of reducing the gross from which any net earnings must be skimmed. The best answer to these challenges lies in building new load and, to a large extent, keeping our existing business sold.

It has been stressed that one sales responsibility confronting us is the sustained development of the domestic market. If we continue properly to build up the residential load it will in the future become a badly needed shock absorber to cushion the abnormal transition from war to peace. A great increase in American home owners is the best insurance we can possibly have in a preservation of our domestic market and our American standards of living.

The fast growing new home market emphasizes one definite sales responsibility. Over one and a half million new homes are needed and the shortage of homes due to many factors is reported to be increasing still further. There has been a constant increase in residential building since 1934 and it is predicted the peak will be reached in possibly 1945. There are two phases of this new home trend that present a decided opportunity for sales work. One is that a majority of these homes are being provided for families of the low income bracket. In the past, the more expensive house dominated the market with but limited appeal to the person with only slightly above average income. The present trend of new houses is directed at the mass market and the problem is being solved by providing homes that these people can afford to buy. The electric industry must focus its promotional work on this same mass market if we are to have a majority of these modestly priced houses adequately wired and electrically equipped.

A second phase of considerable significance regarding the new home market is that over 80 per cent of the housing units are now *single* houses in contrast to only 56 per cent in 1927. This will accelerate the transition of families from renters to home owners. More than one-half of the Nation's 23,200,000 non-farm families are renters. Despite the wider-spread of home ownership, all of these families are excellent prospects for the *idea* of electrical living. Statisticians also point out that new homes are generally bought by the age group between 25 and 45. Modern ideas for electrical living should have an effective sales appeal with these younger families. What we do now to create a demand for and appreciation of the desirability of electric appliances in the home will count heavily in the future.

To maintain electrical living as a criterion of good living is not a job that can be done by selling alone. It requires home service. At this time it seems we would be warranted to contemplate an extension and enlargement of home service programs. We must sustain the reputation for the superior performance of electric appliances in the home during the next few years if we are to have a high degree of public acceptance and a desire for new electrical appliances in the years to come. Moreover, our domestic market is a competitive one, and selling effort through home service will be required to retain this load. We know that home service has aided in keeping our service sold. It has a direct bearing on the trend of kilowatthour usage in the home. Home service is really a part and parcel of progressive selling.

Another sales responsibility is that of continued personal contact with our commercial and industrial customers. While it is true that the actual selling of additional power can hardly be called a sales task for the average utility today, nevertheless, hand-in-hand with this job is the responsibility of keeping our service sold. Periodic systematic contacts with our industrial customers on a personalized basis are fundamental if we are to know these customers and their problems. If we are to build business in the commercial and industrial field, it is our duty to be just as zealous in our effort to serve our present customers

properly as if we had a hundred competitors. If we relax in this job, future competition from other sources of power may cause utilities more concern than heretofore.

We should recognize that many of our commercial and industrial customers are not adequately informed regarding the nature of their individual electrical load, how it is measured and the basis of rate application on which the charges are figured. The voluntary analysis of power accounts for industrial and commercial accounts is one service utilities can render as tangible evidence of a desire to serve these customers. Changes in operating conditions and the usage characteristics of the customer's account are some of the reasons why this service is necessary on a periodic basis. The utility engineers should point out to these customers possible savings that could be effected by correction of power factor, changes in wiring or other operating conditions. During this national emergency, it is even more important, both from a self-interest and a patriotic standpoint, that utilities know their industrial customers and render this type of service through personalized contact with them.

Personal contacts with domestic as well as commercial and industrial customers will also enable us to safeguard against favorable developments being minimized or minor evils being exaggerated. Customer opinion surveys during recent years have disclosed such pertinent information about how others see us. We know that many customers feel that electric rates are high without having any sound basis of fact for this opinion. The surveys show that other customers, just as erroneously, considered electricity relatively high in price and not as reasonable as other commodities based upon what you get for your money. These customers simply reflect a critical attitude toward private electric utilities stimulated by general and oftimes meaningless publicity given to Government project "yardstick" rates.

Regardless of the degree to which these polls truly reflect customer opinion, it is and can be an important aspect of sales work that we come to know our customers better. Through sales contacts we *can* then tell our story about electric rates, taxes and services rendered. This story can be developed for any special area as a part of sales training studies. It can be told effectively in combination with the features and advantages of modern electric appliances. Furthermore, these same facts should be stressed by electrical dealers. The utility company and the dealers, as sales allies, can create a correct understanding about the cheapness of electricity and appreciation of the service we render.

The enlistment of employees of departments other than sales to participate actively in a business building and retention program, is not a new idea. During this period of our national emergency we should be derelict, however, were we to overlook mobilizing this force. The zealousness of employees in repelling slander about the utility industry is largely influenced by the information they have about the company's business. It has been the experience of many utilities that the employees who have been actively engaged in business building programs not only feel they are contributing to the company's success, thus enhancing their opportunity for better jobs, but they take a more active interest in obtaining and using information about the company. In other words, as employees become sales allies they likewise become more company-minded and they are are more concerned about the character of work affecting the company's customer relations.

The prosecution of a sound business-building program concurrent with our National Defense Program, makes it particularly necessary that we maintain an appraisal of factors influencing market development. One important class of information, aside from appliance usage data, is a record of who or what groups of dealers dominate the sale of various types of appliances. A companion study to this is a record of measured advertising to show for any territory the amount of advertising actually done by dealers on the various kinds of appliances. Information of this type has been used successfully as a basis of formulating utility-dealer cooperative sales programs. I believe this type of information should be compiled and made available to the various groups within our industry so that we can have the most efficient and effective degree of united industry effort in executing our sales task. Not only will this be of material assistance during the period of this national emergency but it should serve as a guide to future market development.

I have been much impressed of late by the attitude of leaders in the electric industry toward sustained sales activities. These utility men, as well as appliance and equipment manufacturers, are looking ahead to the day when war orders or defense requirements will be through. I have heard of the executive who felt he need not carry on with sales work or do any more advertising now. Because of the emergency he had 80 per cent of his plant capacity sold to a sure market at a fair profit. As a matter of fact, however, that 20 per cent of his plant which he can still sell to the public represents the only chance he has of returning to normal business when peace comes, as it must eventually. And so it is with each branch of our electric industry. The good will of every company which has something to sell is at stake. Even though only a small portion of the factory output or plant capacity is left to be sold to the public today, the only sound long-range course is sustained selling and advertising.

Our industry at this time should ask "what's the job" and not "what's the use." There is no use whatever in asking "what's the use." We know there is all the use in the world in asking "what's the job." That is the responsibility of sales.

Vision in Defense Industry

"VISION in Defense Industry" will be the subject of a forum to be held at Atlantic City, July 3, in connection with the annual convention of the American Optometric Association.

The forum has been planned to bring together outstanding men in the fields of Government, personnel management, industrial lighting, safety engineering and optometry for a discussion on the importance of vision and its conservation in the present national emergency, and the American Optometric Association extends an invitation to all personnel managers, illuminating engineers and safety engineers to attend and participate in the discussion.

Dr. John R. Wittekind, Consultant to the Public Health Bureau of the American Optometric Association, will preside as Chairman of the forum.

The program follows: "Conservation of Manpower in Defense Industry," Verne A. Zimmer, Director, Division of Labor Standards, U. S. Department of Labor; "Prevention of Eye Injuries in Industry," Harry Guilbert, Director, Bureau of Safety and Compensation, The Pullman Company; "The Problem of Employing Eyes," A. A. Hendrix, Assistant Personnel Director, Ternstedt Division, General Motors Corporation; "Lighting—Old and New," Samuel G. Hibben, Director of Applied Lighting, Westinghouse Electric and Manufacturing Company; "Application of Modern Lighting in Industry," H. L. Logan, Managing Engineer, Controllers Division, Holophane Company, Inc.; "Light, Vision and Seeing in Industry," Dr. Matthew Luckiesh, Director, and Frank K. Moss, Physicist, Lighting Research Laboratory, General Electric Company.

Mobilizing Public Opinion On Electric Service Values

By C. E. Greenwood

Commercial Director, Edison Electric Institute, New York, N. Y.

Address before the Third General Session of the Ninth Annual Convention of the Edison Electric Institute, Buffalo, N. Y., June 4, 1941

DURING the World War number 1, the production facilities of our country were pyramided to such a vast extent that with the conflict over, industry found itself in the immediate years following with factory equipment, the output of which it was quite impossible to distribute. Purchasing power was far above the average, but ability was lacking to market and consume goods in the amount available.

This economic problem became an obligation for all large industries to solve during that period, and out of the study of this sales and promotional requirement came new methods of marketing approach. Analysis and study of markets became of extreme importance. New emphasis was placed on the *consumer* and the products *he* wanted. In the years following, and particularly during the last decade, consumer wants have become the chief consideration in marketing procedure. A basic requirement therefore in building volume output for industry, is the readiness and ability of that industry to mould public opinion through faithful interpretation of such accurate scientific facts on its service and products that will make the consumer want them.

The electric utility industry has registered praiseworthy achievement over many years in pioneering and promoting household appliances for utilization of its service. Its fundamental objective had been defined in simple language by a Court decision in a legal situation that arose in the State of Pennsylvania. The Court stated in substance that the legislature in authorizing the power company to furnish light, heat and power by electricity granted

"something more than furnishing the customer with the end of an insulated copper wire, that he did not know how to use, or had not the appliances to use. It was intended that he should have, and the company should furnish, the conveniences that could be obtained by the use of the electric current."

Managements, however, accepted too generally the thesis that everyone wants

C. E. GREENWOOD

and must use electricity, and all that was required to load the generators was a little advertising and selling. They did not go as far as one of the nation's lawmakers at Washington last month where he stated that "it is not necessary for any company in the light business to advertise." That gentleman is budding 80 years of age and such a childish statement may be excused—or was it an utterance of political prejudice? In earlier years the concept of the utility as a monopoly was more plausible because neither the competitive aspects, nor the sales potentialities of our great industry through National Coordinated Promotion were sensed, at least had not been applied. There had been countless, outstanding examples of individual company accomplishment meriting high praise.

Analyzing the utility industry in the early "twenties," one found engineering standards were of the highest order—the result of National Research, discussion and crystallization. Accounting practices were worked out with skilled technique, and likewise public and customer relations were subjects of deepest study and concern. But National thinking for market development along sustained industry lines did not take root in the sales field until the late twenties. Then it was realized that electrical consumers were being bombarded by other industries for the budget dollar of the household. Planned national activities were making deep impression on public thinking then, and are effective today. Yes—continuing today National promotion of the California Fruit Growers is making people pour the orange juice to absorb vitamins rather than enjoy the succulence of the individual orange; we are eating food of all kinds from cans with much less worry of its purity, people are spending more money for paint that "saving the surface might save all;" people are still "saying it with flowers" on occasions for subtle expressions of regard and affection never dreamed of in earlier years. People are being influenced to greater use of numerous other products by external educational and promotional forces. "Old stuff," you say? Not to the masses. The undertaker works every day in this world and there is an endless sale of baby carriages. Markets constantly change. Some of the trade associations concerned with those promotions enumerated, and on whom we have pinned medals for results, have kept it up for two decades. They have moulded public acceptance and are keeping it moulded. They are catching new generations. Believe it or not, they have caught every one of you — my listeners.

So it was in 1927 that leaders of commercial thought in the electrical industry, foremost among them Mr. James E. Davidson, now President of Nebraska Power Company, were instrumental in having set up in the utility trade association a department for national and local coordination of sales and promotional activity, and for general assistance to member companies for commercial research and market study.

The primary consideration of utility

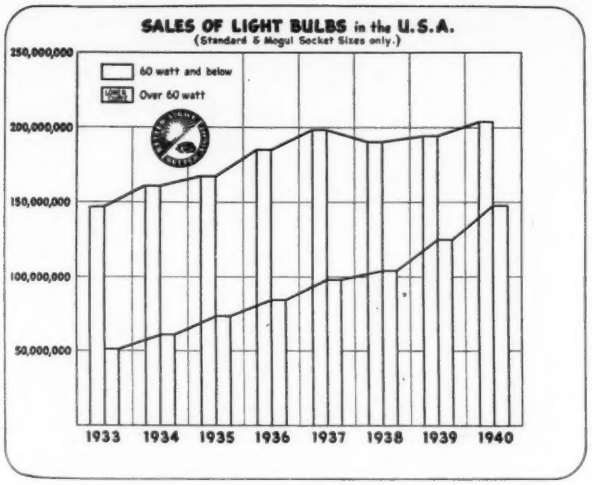


Fig. 1

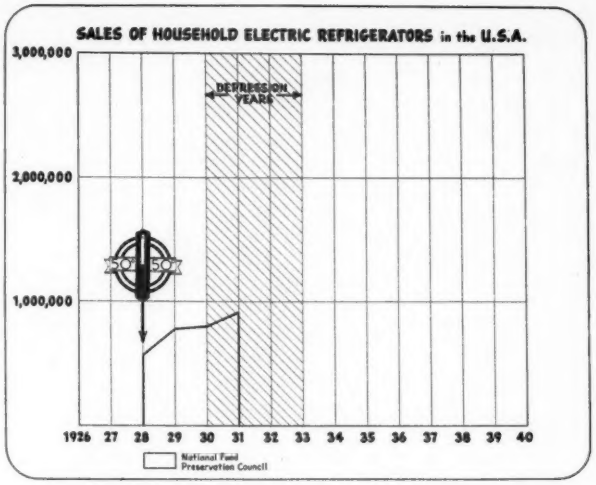

SALES OF HOUSEHOLD ELECTRIC REFRIGERATORS in the U.S.A.
3,000,000
2,000,000
1,000,000
DEPRESSION YEARS
50° 50°
1926 27 28 29 30 31 32 33 34 35 36 37 38 39 40
National Food Preservation Council

Fig. 2

service is Use. The old axiom "You can lead a horse to water but you can't make him drink" fitly applies to consumers of electricity because "we can expose people to electrical equipment, but we cannot force use." Of course *some* use is expected, but my theme is the volume use of service which makes it possible for the company to *offer,* and for consumers to *earn,* the continuously lowered cost of service which has been one of the outstanding achievements of our industry.

You cannot make people buy kilowatt-hours by manoeuvring a 60 or 100-watt lamp into a socket replacing a 25 or 50-watt size. The customer will manoeuvre it back — *unless* — return on the investment can be shown to the consumer for that extra 12c to 18c a month which the higher wattage lamps may add to the bill with normal use. The household consumer really is buying health value, increased eye comfort and efficiency, safety and attractiveness. There are health, social and economic values which justify a new concept of what constitutes good lighting in store, office and factory. But it's not so recorded on the bill rendered by the company for service. It was Benjamin Franklin who wrote this bit of wisdom on the fly-leaf of a book—"If you are not getting into the home with what you have to say you will never get in with what you have to sell." Customers must be enlightened on these subjects of electrical use, and that background of education is a national industry obligation. Mass selling is an all-out aid to sagging business.

Better Light-Better Sight

Out of the economic doldrums existing in 1933 sprang the will to organize industry activity. The Better Light-Better Sight movement organized utilities, lamp manufacturers and numerous other associated interests through Edison Electric Institute for National promotion. The optical industry and the electrical industry have a common purpose in eyesight conservation, and through the Bureau they may pool special knowledge and experience. The Bureau is now in its eighth year of sustained effort and is taking hold of public thinking.

My purpose is not to unfold here promotional details. It's *results* that count —results interpreted in customer acceptance of benefits *received* from the use of higher illumination values in the home to accomplish the many seeing tasks, and subsequent greater energy use, results in satisfaction by merchants for the return received on the investment in Better Lighting, and to office management for the effect on the office force. Again the results obtained in recognized gains to industrial establishments in safety and well-being of employees, the speeding up of operations and greater perfection in the products of industry. These advantages are not enumerated on the lighting bill.

The Better Light-Better Sight program has enlightened public thinking on the use of electric energy for lighting and with magnificent results on lamp wattages.

What does the record say?

Figure 1 shows the trend of the sales of light bulbs in wattages of 60-watt and below. The curve levels off from 1936. On the other hand note the sharp upward trend in bulbs of wattages over 60-watt which shows customer acceptance as they have been enlightened on why they should use higher wattage.

We will look at energy output later.

National Food Preservation Program

The refrigeration story has been as intriguing as lighting. Companies unfolded in the late twenties that salesmen—high-pressure and low-pressure — could not make people buy electric refrigerators because they didn't feel that they needed refrigeration at all, and that a cool cellar or the window-box made supposedly good storage. Droves of salespeople brought back the same answer from utility customers. Yes—this was little more than a dozen years ago. "Why this large investment?" said the skeptical consumer, "To please the utility?" Now what that rich field of prospects didn't know was the return on the investment to them in health alone from the eating of fresh wholesome food. It was a scientific fact written in Government bulletins—and buried there—that above a 50° temperature bacteria growth multiplies rapidly on food, and millions of people were eating unwholesome food daily. Sounded simple, but what a story! Research which followed revealed that but 50 per cent of the homes of the country were using refrigeration of any kind, and but 15 per cent all-year-round refrigeration. Just a handful of existing ice boxes held a 50° temperature. Food spoilage in stupendous quantities resulted. These potent and accurate thoughts were put to work by the National Food Preservation Council, organized within the Electric Utility Trade Association in conjunction with manufacturers. Its educational program continued for two years in cooperation with several food groups coordinat-

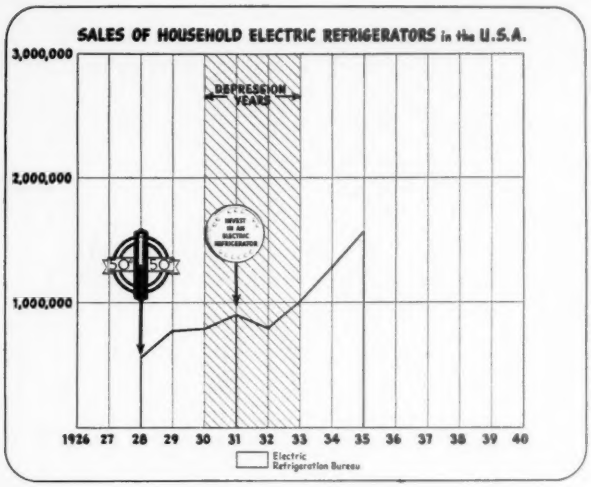


Fig. 3

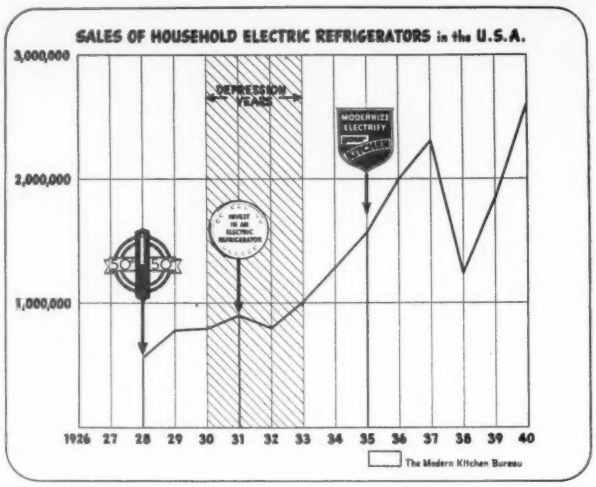


Fig. 4

ing outside the electrical industry. There was a spurt in the sale of all types of refrigeration products. The electric refrigerator market began to expand.

Figure 2 illustrates that the electric refrigerator industry promptly began to benefit from this all educational activity.

Electric Refrigeration Bureau

As a greater market was opened up for general refrigeration practice as a public and family need, it was pointed out by the Electric Refrigeration Bureau which was organized in your Association to succeed the Food Preservation Council, that the *electric* ice box met the requirements for economic savings in food storage and for keeping food fresh for family use, better than any other method existing at that time. The Bureau functioned for four years with startling results, even through depression years.

Let the record, as visualized in Figure 3 speak for itself, except that I would supplement the sales record with a quotation from a recent report of the Metropolitan Life Insurance Company as follows: "Since 1927 there has been a reduction of 83 per cent in deaths due to food poisoning. The increased use of electric refrigeration and better hygenic conditions are responsible for this showing."

So much for our social contribution.

Modern Kitchen Bureau

The electric refrigerator was a first step in further electrification of the kitchen, and expansion of this promotional effort was a natural progressive move. It was timely also, because at that time Federal Housing Administration came into being, to give impetus to the previous attack of the electrical industry on the sale of complete electric kitchen equipment.

In 1933 the Modern Kitchen Bureau was established to enlighten homemakers on the value of the planned kitchen with new styling throughout and with all-electric equipment installed. Mr. L. W. Waters, Vice-President of General Foods Corporation, recently stated in a New York address that "Probably more money and brains are going into the efficiency of the Modern Kitchen today than into all the other rooms of the house put together."

In connection with this National Program, "modernizing" and "electrifying" have become synonymous. A trend has been established which has gained recognition among building groups, real estate operators and mortgage loan agencies. Even many of the new government housing units have all-electric kitchens.

Here is a sustained, coordinated promotional activity, built up on educational and social principles. Four sections of the National Electrical Manufacturers Association have tied in their own product promotion with the overall educational features in order to mobilize public thinking in terms of making the kitchen workshop a place for efficient, labor-saving and comfortable working conditions.

The electric kitchen has become the attraction nucleus in the sale of old homes and new ones. It is reaching a higher peak of interest than ever before obtained in the building field. The contributions of better living which are coming out of this sales activity are supplemented with record breaking sales in electric kitchen equipment.

Figure 4, is a completed picture visualizing promotional results in refrigerator sales coincident with the years of Modern Kitchen Bureau promotion.

Figure 5 tells its own story of results in sales trend of electric ranges in the same five-year period (1935-1940). People are being influenced to want modern kitchens, and with sustained promotion, kitchen styling with electric equipment, will continue to grow and become established construction practice.

Residences and apartments of all classes have all-electric kitchens which did not exist before the Modern Kitchen Program became a reality. They include single and multi-family type structures, privately owned, and slum clearance developments.

Commercial Electric Cooking Council

Encouraged with the results being obtained in gaining acceptance for the all-electric kitchen in the home such as visualized here, national attention has been given to the commercial kitchen of food dispensing establishments, especially commercial cooking equipment of the counter variety. The step-by-step process of serving this market is appealing. It will be agreed generally that situations now obtain which will make it important soon for the power industry to give the commercial classification of business the same intensive sales and promotional attention as the domestic classification has received over the last decade. Results of intensification on lighting and cooking already commands attention.

The program of the National Commercial Electric Cooking Council estab-

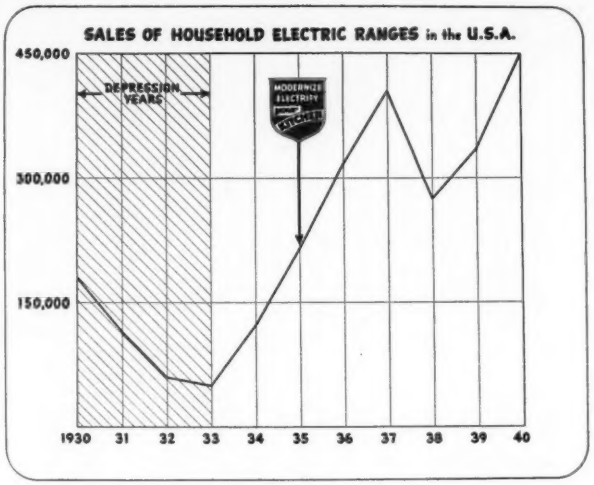


Fig. 5

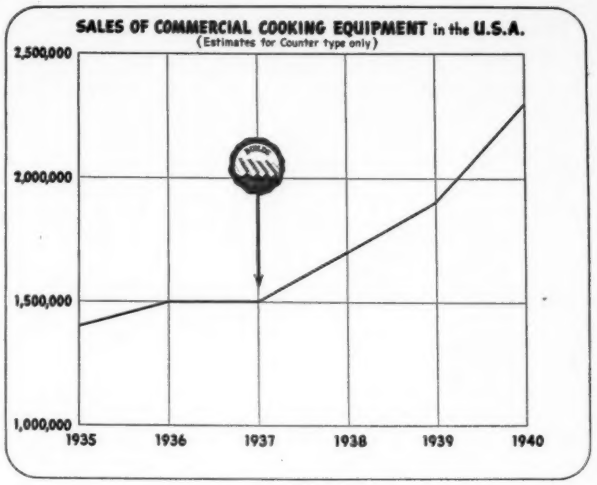


Fig. 6

lished with Edison Electric Institute as a sponsor, in conjunction with equipment manufacturers, which incidentally is a prime essential in all our activities, is but a start toward broader achievement. This market among food dispensing establishments is as large as the American appetite. Owners and operators may have clean, portable and adaptable cooking service with quality cooking resulting from absolute temperature control. Special sales appeal in this counter type equipment is the ability of diners to watch the cooking process. When one realizes that an average of 50 per cent of the gross profit of drug store operation comes from the luncheonette, it is not difficult to sense the potentialities of the market for equipment in the thousands of other restaurants. The restaurant business is now more successful than at any time in its history.

Utility gain in this field is indicated by test and survey which show an approximate annual energy use of 1500 kwhrs per connected load on such equipment. There are statistical experts who point out that there can be approximately 1 kw of commercial electric cooking equipment connected in restaurants for each urban family Combination companies find this counter service supplements their heavy-duty gas sales which further expands market potentialities.

The Council is starting its fifth year of sustained promotional activity.

Figure 6 visualizes the trend of volume sales of equipment over four years. Ground work in this group of customers is showing its effect.

Also note in Figure 7 the trend of energy output in the commercial classification of the utility business coincident with the Better Light-Better Sight movement and intensive development of commercial cooking. Without question these educational backgrounds are giving impetus to local sales results like in other industry activities.

Electric Water Systems Council

Now rural neighbors have not been forgotten in sales intensification. The disadvantages in living conditions for homes not having running water are too many to enlarge upon here. The Census of 1930 revealed there were hundreds of thousands of them. The values in sanitation, health protection and convenience where an electric water system is installed are immeasurable. To repeat, it was, and is, a National function of our Association to tackle every electric service to which it is desirable to apply an educational background to speed up local product selling. Each one of them serves distinct human needs and at the same time measurable commercial return results which help pay for promotional costs.

In a survey of one thousand homes in scattered communities, in the months before and after the installation of Running Water, it was revealed that the kilowatt hour use jumped approximately 55 per cent, not because of energy output through the water system alone, but because a higher plane of living prevailed and consequently greater electrical use.

The Electric Water Systems Council is composed of representatives of Edison Electric Institute working cooperatively with the pump manufacturers, and it is

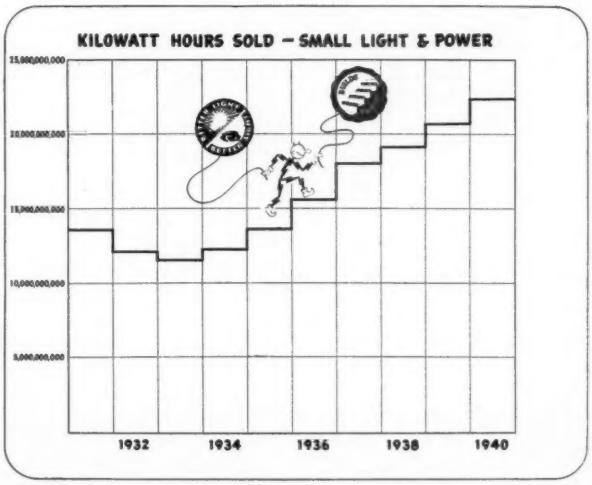


Fig. 7

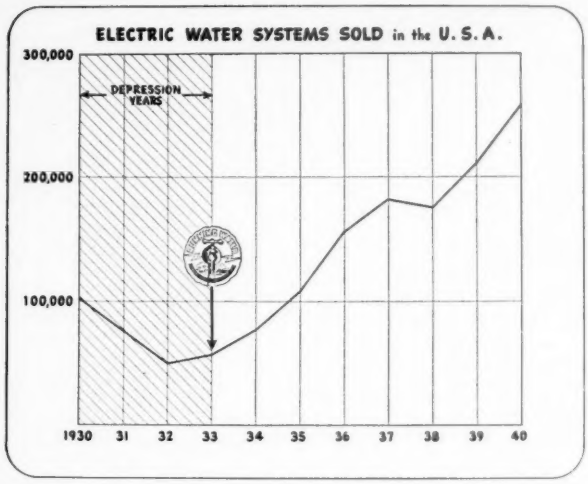


Fig. 8

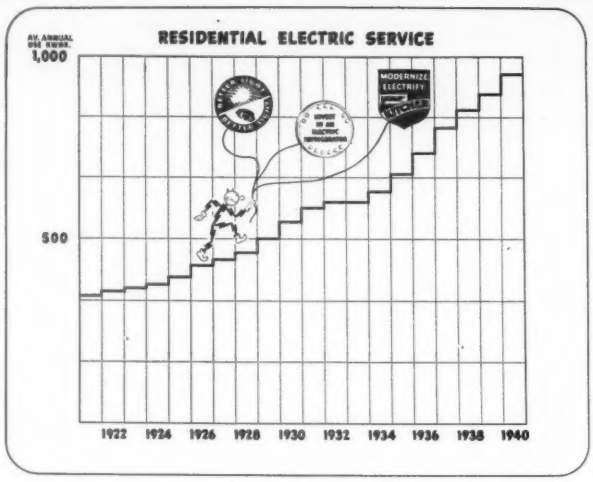


Fig. 9

in its eighth year of progressive development. This Council activity carries through local utilities, dealers, the plumbing trade, local farm organizations and numerous other groups a message of service values through use of an electric water system.

And the result is pictured in Figure 8. Sales are on the up-and-up to the benefit of the farmer and ultimately to the utilities and the trades.

Other Advantages

In any evaluation of these promotional undertakings from the utility standpoint, one cannot rightfully base conclusions on tangible results only—those measured in return on the investment in its generating and distributing facilities. These are unquestionably major considerations, but I would refer briefly to two other advantages. The first concerns utility-customer relationships which is an essential to business virility.

On this point it is pertinent to emphasize that the electric utility industry that holds its convention here today is less understood and less appreciated than most others. We are in that unfortunate position because the product that the utility manufactures and sells is mysterious in itself. It cannot be wrapped up in a pretty container, nor placed on attractive display. Instead of streamlined trucks delivering the utility product, it travels out-of-sight of the purchasers, either underground or on so-termed "unsightly" poles far above their heads. Don't touch it—it's dangerous! But here's the bill for it in the terms nobody knows—and the customer ejaculates, "What in Hell is a kilowatt-hour? Your rates are too high." It is a near tragedy that electric service which plays such a stupendous part in human existence must take it on the chin as the result of these and other agencies beyond our control.

The utility industry can be mobilized to perform most effectively through the trade association, because here are gathered the experiences and performances of the hundred of units that make up the industry, which can be culled over and studied for those that brought greatest results. The common denominator in thought and in success is given to benefit industry. However, we have done nothing along nationally coordinated lines in the institutional interpretation of "Electric Service."

There has been partial compensation, for any lack of such institutional advertising activity, in the national sales programs which travel the highways and byways, with the help of local tie-ins. A unified message on the values of electric service for specific human needs has registered to a praiseworthy degree. Creative thoughts of the many in the utility field have been drafted. These are blended with promotional ideas of the manufacturers of equipment and other trades that have a stake with the utility in business building. Vitality is given to the scientific and business facts gained by moulding them into planned programs, and they are motivated with local tie-ins from Coast to Coast by all units which may benefit in some form. It is similar action that has contributed to the building of scores of leading industries of the nation. But we have still far to go.

One more intangible of national coordination through the utility Trade Association is the stimulating affects on the manufacturers, distributors, and dealers of all classes. They are all drawn into the marketing area of activity, and even organizations outside the industry join us. Every program that is built up is cooperative in its thinking, nationally and locally. They are business builders for every sales unit. This common understanding in selling develops through contact and acquaintanceship, closer knowledge of utility service on the part of these cooperating units of the industry which are extensive in numbers.

The results of industry selling in the household equipment field can be put into figures.

In Figure 9, selling the use of electric service is divided into two periods. In one, each utility sold equipment or service alone, and in the other period (1928 to 1940) national and local coordinated industry selling placed a background of public enlightenment behind selling. On the basis of results indicated which will you choose?

Henry David Thoreau is credited with saying "Our horizon is never quite at our elbows." How true is that expression today! Organization for national defense is the emergency "at our elbows." It must absorb our interest and the very fiber of our company organizations before the emergency is past, because is not electricity the keystone of the defense problem? Nevertheless, we must not fail to see through a horizon that is within our reach—the day of reckoning—and beyond it is that which we label the post-war period. It is then

(*Continued on page* 272)

Plus Sales and Service Values Pay Off

By Tom P. Walker

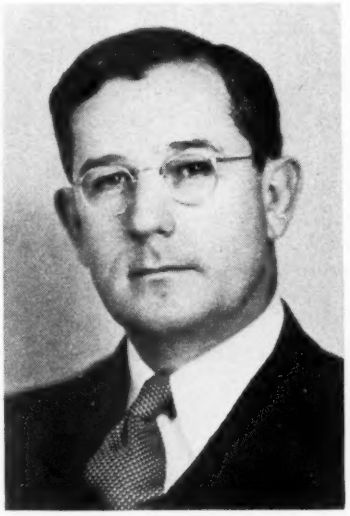
President, Gulf States Utilities Company, Beaumont, Texas

Address before the First General Session of the Ninth Annual Convention of the Edison Electric Institute, Buffalo, N. Y., June 3, 1941

THE problem of substitutes — of "something just as good" at a price—is as old as merchandising itself. It has been with the manufacturer of quality branded products from time immemorial. He has grown gray and sometimes gone to an early grave trying to do something about the imitator who waited until the demand had been created; then stepped into the picture with a duplicate of the product or a reasonable facsimile thereof, at a cut price to skim the cream. Never yet has the manufacturer of quality merchandise found a way to eliminate his cut-price competition completely, for there will always be persons who believe that you can get something for nothing.

Until recently substitutes for our kind of service were offered so rarely that the problem was purely local. It seems to me that now, for the first time, we find ourselves in the position of that manufacturer of a standard quality brand. If, when the customer came to shop in the days gone by, we could convince him that our service was somewhat better and a little bit cheaper than it had been before, he was apt to be satisfied. He may have wished—out loud—that there was a store next door which sold electric service, so he could shop around; but nine times out of ten he didn't really mean it because we did give better service each year at lower rates and better merchandise at lower prices and that was something he didn't always get at other places he traded.

But now, figuratively, there is a store next door—a store operated by the biggest firm of all—offering electricity at cut rates as a side line to its many other lines. This store may not actually be in your community or mine, but through its "advertising" in the news columns, the magazines and on the radio, it has created or sought to create the impression that if it were in your community or mine our folks could buy "something just as good" for a great deal less. As this firm has an excellent reputation in many fields of endeavor, its so-called public ownership cut-price competition is more of a problem than that encountered in most fields of merchandising where the cut-price manufacturer is usually an unknown quantity.



MR. WALKER

At the same time our competitor is working on our markets, he is keeping us busy in the court house, the legislative halls and in ponderous hearings before boards and bureaus, forcing us well nigh to abandon the one front on which our final victory or defeat depends. The people of this land are too discriminating ever to be content to have so intimate a service as ours supplied by a cold impersonal political bureau whose single announced goal is a cheap price.

In simple terms, ours is the old, old business problem of price-cutting with inferior merchandise offered to tear down by fair means or foul a quality product that has taken years of effort to develop. No one without the experience acquired during that development period can hope to imitate it. But judges, juries, aldermen, boards and commissioners will not yield to our fervent legal and technical pleas unless and until twenty-five million housewives in their kitchens and four million crossroads merchants around their cracker barrels are completely sold on the idea that their best interest is served by a trained, live business organization, fired with an aptitude for clean competition and honestly and frankly seeking a reasonable reward for its efforts.

There are two standard approaches to the price-cutting problem: The first undercuts the price-cutter without regard for the consequences. If painfully accumulated resources must be sacrificed to the point that the growing needs of the public are jeopardized, or if the quality of the product must be reduced to a pitiful semblance of its former value—these mean nothing to the really enthusiastic price-cutter. True price-cutting has had some fleeting successes where applied ruthlessly enough by business bandits whom the government later prosecuted as being against the public interest. But more often grief comes to the price-cutter. The record is against him. The utility industry has no chance whatever of winning a price-cutting war with the government of the United States in its present state of mind.

The second approach retains all the necessary elements of quality which the public deserves, and maintains a reasonable price to pay for that quality. It is this approach that has brought success to those businesses which today we recognize as leaders for all the world. It is only through this approach—the adding of plus values to our sales and service efforts—that we may find some hope in our situation.

At the outset we should agree that we will fail if we try to palm off as plus values our problems, our handicaps and our fears. People are not interested in our tax burden; they have one of their

own. They can't see what they have to lose from the battle against high rates. Private initiative? Socialism? Dictatorship? T.V.A.? All these are distant and obscure. Rates are here today in the home and the store. And every crossroads merchant has an unfair competitor much closer to his heart and mind than ours will ever be. He is just not interested. He believes to a greater or less degree that somehow his day-to-day welfare is tied in with what happens in Tennessee or on the Columbia River; that the biggest dam in the world means something to his health and happiness; and that the stringing of wires to obscure farms will bring to his modest little cottage on Main Street some beneficence, though he knows not what it is. The customer very frankly wants lower rates, but he will insist that his brand of service be not impaired. He has seen us rush to court with each new threat and thinks we are going over his head. It is our challenge to quit thinking of the public in the singular—something to be dealt with as a whole—and reduce our service to its least common denominator: the individual and immediate needs of the people who buy our service. Hold the legal front as best we may; cover our retreat before political bureaus and pressures (if retreat we must) as firmly and manfully as possible; but let us, too, become intensely active on the home front where, in the final analysis, the case will be decided.

Down our way we have for a long time had to think in terms of plus values, for we have had the competition of cheap natural gas for years. Never in our corporate history have we been able to say to our customers "Do it electrically because you can do it more cheaply." In all of our load building activities (the few obvious exceptions will occur to you) we have had to sell the idea that we could do it better than our competitor.

We have had to make the people want to pay a little more to trade with us for certain services. We offer that it can be done with reasonable success and we offer that if people will pay more for plus values in electric service as compared to gas, they will pay more for plus values in one electric service as compared to another electric service if you can make them see that they are getting plus values for their money in paying a higher price.

Our experience has been that the more service you sell the housewife and the merchant, the more pleased they will be. Accordingly, we have actively and definitely promoted what I choose to call plus values in our sales and service efforts. The rates of our company have not been the lowest, but in its territory, where cheap natural gas is abundant, the gas rates have been high in the customer's mind more often than the electric rates.

There have been threats of municipal competition just as there have been in other sections of the country, and in the two instances where it materialized, out of a total of 270 communities served, the company has accepted it as its responsibility and opportunity, if you please, to demonstrate the difference between our way and the politician's way. Total customers served in these two communities before competition ten years ago in the case of one, and two years ago for the other, were 1154. Today we serve in these same communities only 409 fewer; and there is definite evidence that the company's plus values are winning still more of the cities' customers. Even our competitors would admit, I believe, that our share of the total would be much greater but for the pressure—real and implied—which the municipal plant backers exert on the relatively small populations.

In the largest city wherein the company operates, a new city administration gave a thirty-year franchise to an oil engine salesman who promised to spend three million dollars of his own money to add taxable values, to furnish jobs and to reduce rates. The customers in that city, as a recognition of the company's plus value policy, voted almost two to one that the franchise be not granted. Many unsuspected friends actively supported the company and worked for the defeat of the franchise—something almost unknown in these days. This support wasn't earned during the week before election. It was won by years of plus-value service. This evidence is given not to brag, nor to open old wounds, but only as a background for a discussion of some of the plus values that have gone into this service and as an earnest that they do pay off.

Among the plus values that I would discuss with you briefly are: (a) Rates as low as economically feasible but—and this is more important—of such design that they promote the widest possible use of our product; (b) an aggressive sales program either by the company or company-promoted through dealers; (c) intensified personal attention to the individual customer through company representatives having sufficient intelligence and training to handle to conclusion a maximum number of customer requirements on the first contact; and (d) a spirit of cheerful optimism and helpful service on the part of all personnel, expressed by more human understanding of the personal needs for service of our customers.

Of these, I'd say that individual treatment of the customer, the value to him of that feeling that his problems are worthy of your special attention, is the greatest plus value we can offer.

So let's charge rates that will keep our companies and physical properties in a healthy condition to give dependable service. Design them, if we can, to encourage greater use of our service and aggressively merchandise yourself and through dealers so that the average rate earned by most customers will be fairly in line with private and public competition.

The present trend in rate-making is to hammer the top step down, hoping when the next F.P.C. comparisons appear suddenly in the morning paper ours will be more favorable than it was last year, and that a nearby municipal plant which we know is about to fall apart will be farther down the list. That this is a futile chase can easily be shown by the fact that those with the lowest charges also have severe rate controversies.

You may be interested to know that in the instance of the thirty-year franchise granted the oil engine salesman I referred to a few minutes ago, city officials offered to refuse to grant the competing franchise if we would substantially reduce our rates. We declined to horse-trade on that basis; told our customers that we could afford to make reductions only as justified by use and as planned unless they were willing to have the quality of service sacrificed. The two-to-one vote against the granting of the other franchise indicated that they saw the reasonableness of our position. In view of such evidence, it is no wonder we believe that plus values rather than price-cutting is the ultimate answer.

Our rate engineers, however, should pay more and more attention to the increment cost to the customer of operating a refrigerator over and above the cost of lights and small appliances; then to the further increment cost of operating a range over and above all other services; then on and on through the long

list of new major appliances such as attic fans, air conditioning, heating, etc., which beckon our talents.

Similarly there is an opportunity to design commercial rates in such a manner as to increase the effectiveness of our service to business. Simplified commercial rates for service through one meter offer large opportunities for greater customer satisfaction. Single meter rates simplify customer's wiring, eliminate problems in rate application, pass the benefit of diversity on to the customer and, when a load factor feature is included, give him the incentive to promote his own business by intensifying his use of electricity at a low increment cost.

Shall we say, then, that plus values may be put into rate design by de-emphasizing as far as possible the competition for preferred position in rate comparisons? Reduce rates voluntarily when possible and graciously when required by regulatory authority, but insist as firmly as expedient that they be designed so that greater use is encouraged. Then add plus effort to cause the individual customer to appreciate their hidden values, and plus enthusiasm to arouse response.

Plus sales values may mean more merchandise for the money and should, within sound bounds, but definitely should not otherwise. There is a very important job for the utility in promoting the use of electrical equipment in the home, and while no standard pattern can be cut to fit every situation, certain principles apply generally. Nothing is more devastating, it seems to me, than merchandising by a utility so aggressive that all other outlets are dried up and customers feel their electric rates help pay merchandising losses. On the other hand, no policy is so ill-advised as that which spends large sums in paternalistic dealer programs, leaving no merchandising responsibility on him but giving him all the profit. The plus values a utility can put into merchandising come through a well-ordered program in which the utility should have a substantial part and which is designed to produce sound, aggressive sales of standard merchandise at prices that justify maximum effort. How that can best be accomplished depends on local conditions, but the most satisfactory results generally are obtained where the utility itself merchandises—but only as merchants—avoiding the unfair use of its utility facilities to stifle dealer competition. There is a common ground on which progressive dealers will meet—yes, even be stimulated by utility merchandising competition—and where this common ground can be found in any given situation, there the best results are obtained. In any event, utility assistance should be provided through home demonstrators, neighborhood cooking schools, engineering advice for architects, good service practices, and for the commercial customer well-trained power engineers and lighting experts. Perhaps the greatest plus value a utility can put behind any sales program is the enthusiasm of its own personnel, sold on the electric way and themselves using these appliances to the maximum. Their satisfaction, fanning out into all the community, can do more to create a desire than almost any other device.

Some housewives enjoy the excitement of the day when morning callers come to the back door with services to offer or goods to sell. There is a certain stimulation in the unexpected visits of unexpected persons with unexpected things. Many housewives, however, resent these callers and tolerate them only because they are necessary to a well-ordered way of living for them. They know the electric meter has to be read, and more often than not are not even aware of the meter reader's visit. When they do encounter him, some may wonder cynically how much he has over-read the meter. If he is quiet enough not to be noticed, he may later be suspected of guessing at the reading, and if he leaves a mark in the flower bed or on the back porch so that the housewife may know he was there, he may get a particular kind of blessing-out.

Then there is the salesman who puts his toe in the door to tell the women that they need something which they have probably decided they can very well do without.

Then comes the collector and the appliance repairman and the home economist and on special occasions the extra man who comes around just to find out if you are satisfied with your service and what he can do to make your life happier! All these from the electric company.

Each of these utility representatives is a specialist in his job and probably a good one, but no one knows the work of the other, and too frequently has no interest in it. The collector is not interested in the range the salesman sold two months ago; he is raising a fuss because the customer is not paying the way it was planned.

A salesman can't explain the meter reader's inaccuracies; he has to be on to the next house in order to make his commission; and the meter reader doesn't know anything about any of it except the mysterious little black box on the back porch.

We do not have this multi-specialist type of service, nor do we have the gold-plated district representative plan which largely fell by the wayside during the early Thirties because the cost was thought too high. We do have a compromise between the two which we believe gives that personal attention to each individual customer which handles to conclusion a maximum number of his requirements on the first contact. We call these men district representatives and we require them to look over the needs of only a limited number of customers. They do the selling, the meter reading, a little of the collecting, and even some of the appliance repairs. Except for some unusual need, they are the only company representatives that see the customer at home. They have the training and the capacity, and above all the attitude toward their job which enable them to be guides and counselors rather than cause for a peeve. The number of meters to be read in any day's work is not so great as to prevent a pause at the customer's back door to talk over matters of mutual interest to company and customer and get acquainted with the individual customer; to personalize the service.

The district representative does not have many skips which result in two or three months' bills rolling up before the meter can be read. Meters are read more accurately, and as he goes about he can repair an iron cord, explain variations in the bill, help arrange for a transfer from one location to another, or interpret rates. He is trained to watch for wires touching trees, house brackets pulled off from the house, improperly installed meters and other mechanical or electrical defects which might disrupt service. He knows the homes where there is sickness or misfortune and can make reasonable arrangements about payment of bills; and he knows, too, the customers who would take advantage of any yielding of proper pressure and he knows how to handle them. New customers are brought into cordial relationship with the utility family much earlier through this employee. He can judge the proper time to push the additional appliance without being in the attitude

of high-pressuring the customer; and he makes one contact with the customer instead of having from three to six persons calling at irregular intervals. This man knows how to adjust almost every complaint and explain commonly used rates.

He knows something of the broader features of the business, and while he is adjured to avoid controversy can hold his own in debate where his company and its practices are being discussed. He is in fact quite competent to interpret the company clearly and sympathetically to the customer and the customer in turn to the company.

This is plus service and it is the sort of plus service that is welcomed by the customer and that pays off much more than its actual cost.

There is the matter of stores, or offices, as you may choose to call them. Is your place of business a marble palace, cold as the inside of an Eskimo's igloo? Does it suggest that you make so much money you have to put it into stained-glass windows to get rid of it? Is it the other extreme: run-down, unpainted, dingy, uninviting? Or is it a middle-of-the-road sort of place that, conveniently located for the customer, reflects a spirit of welcome and a promise of a pleasant business visit?

A spirit of cheerful optimism and helpful service on the part of personnel which results in a more human and understanding response to the personal needs for service of our customers is perhaps the most important plus value. Withal, it is the most difficult to achieve, although perhaps the cheapest in money cost. Is it not the ultimate expression of our own pride and satisfaction in the job we're doing? One might detail a long list of extraneous and elusive items to picture the sort of attitude each member of the organization should constantly maintain in order to create the atmosphere that appeals to the individual customer. Or again, the treatment might be in the nature of an inspirational address dealing in psychological reactions, emotion-stirring episodes and intimate experiences which furnish opportunities to turn a neat trick in public relations.

Either treatment probably would be overdone and either could lead into unreal and absurd by-ways. Yet there is something very definite, very real, and very important in the attitude with which the employees of the company go about their daily work. This atmosphere is seldom a product of studied programs and rigid formulas. It isn't something that can be disposed of by hiring a public relations man or a personnel director, no matter how capable he may be. It isn't a special kind of varnish that can be sprayed on, nor an elixir that can be taken by the spoonful or bottle. It is more a flower that blooms only after living and working together for some result—too intangible to put in a rule book and yet as substantial as the product of the churches, charitable organizations and other agencies whose work we admire and approve but whose accomplishments we never try to write down in a cold ledger. Perhaps you like to call this quality personality, or perhaps character. There is one bank you prefer above all others in which to do business; one haberdasher where you feel more at home than in any other you may trade. You like a certain restaurant better than all the others, sometimes in spite of the food they serve. Some businesses, by the compulsion of competition, have had to learn of the little things that are important, the flattering courtesies that mean so much in every-day contacts, the friendliness, the consideration, the thoughtfulness. There is no hypocrisy in their attitude; they are showing sincerely their pride and enthusiasm for their jobs and their institutions.

It is possible for a utility organization to develop just such a spirit and when it does, its day-to-day work will appear very much more as if it had a competitor across the street with a finger beckoning its every customer. It is this spirit that prompts managements to extend credit as graciously and as freely as a dry goods store would; which returns deposits when the customer has proved that he is worthy of trust. This spirit will produce a reasonable amount of community service on the part of the members of the organization — not the variety that splashes thousands of dollars around recklessly in indiscriminate donations and extravagant contributions, but that which takes a reasonable time to put forth personal effort—something more wholesome than a vulgar display of money and more satisfying. This sort of a spirit prompts the selection of personnel as much for ability to be human, capacity for friendliness and for altitude of ideals as it does for aptitude with a typewriter, a column of figures or a slide rule, or relationship with some big shot or ward-heeler. And it is this sort of a spirit that keeps its employees constantly informed on broad factors working in the industry and inspires them continually with a realistic picture of the opportunities for service and success which the industry still offers. They will not then be over-burdened and discouraged with the problems of the industry but will rather talk confidently, intelligently and enthusiastically with the conviction and optimism of the natural-born salesman who probably got that way only by a lot of hard work!

There are social and economic changes in the making, and some of these seem to contradict principles which we have always assumed were too fundamental to change. Many of the old landmarks are obscured; our fellow-workers perplexed and confused. They need the calm, confident and competent guiding hand of experience to lead them to the highest satisfaction in the job we are trying to do together. They need a new hope that has a ring of victory in it.

We must be flexible enough to accommodate ourselves to new trends without losing the will to assert forcefully our faith in the basic factors we know should control. This business of ours has by no means reached its highest opportunities. It is still young and virile and has within it the strength to shake off any amount of abuse and rise stronger for having met the challenge.

Let us keep our death sentence pains between ourselves and the bureaus. Let us meet our increased taxes with calm determination just as every good citizen will meet his. Let us face competition even though we believe it unfair just as the merchant has to meet it—as a challenge to prove that years of training and honest dealing make us worthy of the confidence and respect of the electric users of the nation.

With bold rate policies that refuse to sacrifice sound practice for expediency; with aggressive promotional sales effort and education; with a streamlined organization which puts on the firing line sufficient brains and authority really to serve the customer in a personal way; and through a new emphasis on an attitude of willing and enthusiastic service to the individual needs of human beings, may we come to an awakened appreciation of our own abilities and opportunities and assert an inspired leadership for thousands of loyal fellow-workers anxiously waiting for a confident word of encouragement to carry on to greater heights than we have ever dreamed were possible.

The time has come for such a united program. Only a little later may be too late.

Emergency Capabilities of Distribution Plant

By T. G. Hieronymus

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An address before the Second General Session of the Ninth Annual Convention of the Edison Electric Institute, Buffalo, N. Y., June 3, 1941

RAPIDLY increasing demands of army, navy and other governmental agencies, for enormous quantities of almost every conceivable kind of manufactured product, has definitely done things to the load curves of the distribution system of electric utilities of these United States.

Many of our present distribution engineers were young men in the engineering departments of utility companies during the last war and they remember the difficulties experienced in getting supplies. They still remember some of the problems met in keeping their equipment in service.

There is hardly a property in the country where storm, flood, or other disaster has not caused distribution engineers to "tear their hair." In the end, however, they have kept service going, and thus, they have had some preparation for the task with which they are now confronted.

I shall make no attempt whatever to discuss the values of load-increases resulting from the preparedness program but shall confine my remarks to the effect it is having upon distribution plant and to what distribution engineers plan to do about it.

Load Increases

When a new defense plant such as a small arms ammunition plant is started near a city and the papers carry the statement that there will be over 8,000 people employed, the average person realizes very little of just what that actually represents to the power company supplying electric service.

A new load of 10,000 kw at such a plant generally requires the building of one or more transmission lines direct from the nearest generating station to the plant. That is a rather simple procedure.

The real increases resulting from the defense program come in providing for those 8000 additional people, furnishing them with homes, food, clothing, furniture, etc.

MR. HIERONYMUS

The effects are varied and many, e.g., to help feed these people a new grocery store opens, the wholesale grocer, the bakery, the packing house and all those who supply that grocer see an increase in their business.

All these many business increases multiplied many times mean more scattered increases in distribution load.

The small little-known manufacturing plants on the side streets or in the light-industry sections of the city are being greatly affected by the defense program but there is very little in the newspapers about it.

Just to take a trip into one of the light industry sections of a large city and check up on some of these small plants.

Here we see a one-story building 75 feet wide, 300 feet deep, looking as if it were ready to fall down. The front windows are so dirty that it is hard to see through to tell what is inside. We step inside of the door and find ourselves in a small office with possibly one stenographer sitting at a dilapidated typewriter with a more dilapidated adding machine over in the corner. Piled everywhere, there are papers, old orders, and general litter collected over the years.

We go on through into the main large rear room and there we find numerous machines, such as drill presses, lathes, shapers and punch presses.

In 1927, 1928 and 1929 these plants were running with a load that justified a large bank of transformers in rear of the building, then due to the depression the bottom dropped out of things and the machines became idle over night.

At that time the distribution engineers of the local power company checked into the situation and found that while large transformers were not needed they never knew when the manufacturer might get an order that would put the equipment back to work, so the transformers were left connected with little or no load on the system.

Now we move to 1941 and an order comes through for machine parts or a product that this plant can make. Over night the picture changes and instead of machines covered with cobwebs, we find them all running full blast. Other shops and other small manufacturers in this section have also found a demand to put their idle equipment back to work.

The distribution engineer who has rearranged the system to take care of the former normal conditions, finds himself with greatly increased loads on substations, cables, overhead circuits, etc., and yet no request for increased loads has come through the Commercial Department to give him an idea what to expect.

It is not the well advertised new loads that are problems because they generally allow time for normal planning, buying, and installing the necessary equipment but it is the gradual increase of load in many small increments that makes the distribution engineer glad he has some "rubber" in his equipment.

Last October when the engineers of one property were making up their budget for 1941, they checked all station and circuit loads and in one particular light-industry district they found that the substation containing 2—7500 kva transformers was quite adequate to take

care of the normally expected load increases in that area during 1941.

In January 1941, the load on this station had so increased almost overnight that it was decided to order a new 7500 kva transformer and a new 13 kv supply cable for installation this summer rather than wait until 1942.

Load increases are coming from the most unexpected places. As an example, right downtown in the heart of the shopping district, an old time uniform tailor has had offices for many years. As a result of government orders for soldier uniforms, he has greatly increased his floor space over the original amount and has installed individual power driven sewing machines and other devices so that now his load is several times what it had been and the engineers are expecting still further increases.

Tent and awning companies who have struggled to make a bare living since the depression, find themselves working nights turning out canvas products for the army.

These are just a few examples of the many places on the distribution system where the loads have increased in relatively small increments but with an aggregate that makes the distribution engineer sit up nights and talk to himself.

Let's look in on the distribution engineer and see what he is doing about all this.

He has done two things. First, he has placed orders for earliest possible delivery of the necessary equipment, rearranged his circuits, robbed his normal storeroom emergency supply and kept his system operating in the usual manner. Second, he has packed his bag, loaded his problems into a brief case, and taken a trip along with other engineers from other companies to the Transmission & Distribution Committee Meetings of the E. E. I. where he has aired his problems and discussed them with other engineers in similar predicaments.

The main theme of the last three meetings of the committees at Atlanta, in Detroit, and in Chicago, has been the effect of the defense program and what should be done about it.

Some of the problems discussed are herewith given.

Increased Cable Loading

Probably the one subject that was most discussed from every angle was the question of just how much additional load over and above normal established rating can be put on existing underground circuits without those circuits going out of commission before the return of normalcy. Instead of 20 or 25 or possibly 30 years of useful life in a cable as at present, it might be economical to so load those cables that the life would be 5 or 7 years, so as to get through the emergency period and then replace the circuits after the 5 or 7 year period.

We know, of course, from past experience that the life of a cable is materially shortened as the temperature of the insulating medium is raised above a certain maximum value.

For this reason, special thermo couples are being installed by many companies and heat flow studies made so as to determine just how far we may safely go with increased cable loadings during the emergency.

Current carrying capacity tables for heavy loaded duct lines are very conservative and it is expected that actual tests will allow an increase in cable ratings well above that used in the past.

If the ducts in which the cables are installed are large in comparison with the cable diameter, a great deal of expansion can take place in the conduit without any appreciable expansion out into the manholes.

On the other hand, if the conduits are small, there will not be room for such "snaking" in the duct, with the result that the effect of expansion and contraction will be concentrated in the manholes and this may result in the mechanical failure of the lead sheath due to intercrystaline fatigue. Fortunately there has been a general trend in recent years toward the use of larger sized ducts but expansion considerations are still based on the smaller sizes. Thus, there is an additional factor of safety for those systems employing larger sizes of conduits that may well be utilized if warranted by emergency conditions.

Manholes

In the case of the older, smaller, improperly designed manholes, where, in racking the cables, consideration was not given to expansion and contraction of cables due to overloading, the results have often been disastrous when attempts were made to overload such circuits.

Where such small manholes exist and it is not desirable to completely rebuild by enlarging them, a great deal of assistance can be obtained towards bettering the cable conditions by installing flares at the ends of the manholes.

This can be done without the necessity of changing the walls, floor, or roof, and at comparatively little expense. Then the cables may be so placed that they will stand considerable movement due to overloading and still not be damaged.

In order to take care of much greater expansion resulting from unusual temperature conditions in addition to overloading of cables, there are a number of expedients that may be employed.

Enlarging the manhole sufficiently that any amount of expansion on any number of cables can be accommodated without damaging the cables is the best but the most expensive method. However, it may avoid the building of a whole new conduit line.

Another method where few cables are involved, is to use complete expansion loops in the cable with the joints relieved from strain.

The type of fireproofing or arc proofing used on cables in manholes can have considerable effect upon the expansion and contraction by stiffening of the cables often with disastrous results to the sheath. Relative merits of various types of arc-proofing are being studied by the committee.

Temporary Repairs

Experience teaches that an explosion in a manhole very often may wreck as much as 35 ft. of manhole and conduit line.

A number of companies are now stocking reels of cable twice as long as they normally would be required to use in order to bridge around a manhole that might be so damaged.

It is possible to punch a hole in the wall or roof of the undisturbed manhole either way from the damaged manhole, open the joints on the cable, and splice in temporary double length sections running along the street.

By installing a wooden conduit line for the temporary cables, they will be protected from traffic or other damage until such time as the damaged conduit and manhole can be rebuilt.

Duct Splices

In such cases, the good portions of the blown-up cable can be removed and duct spliced so that they can be re-used elsewhere.

More and more engineers are beginning to realize the desirability of making duct splices. Tests show them to be better than the ordinary manhole type of splice. One company has a record of six failures on 6000 duct splices over an eight year period, which is sufficient evidence that duct splices are perfectly satisfactory.

The lead sheath is burned in place and

the completed joint is seldom more than ¼ inch greater in diameter than the rest of the cable.

As an example of economies, one company has found that on 400 M.C.M., 3 conductor, 13 kv cable, it is more economical to duct splice 50 ft. lengths of cable and put them back in plant account as new cable than it is to junk those short sections and realize only the salvage value of copper and lead, which is the case when large numbers of short pieces of cable accumulate in the storeroom.

Fire Fighting Equipment

In addition to explosive violence, there is the problem of fires, especially in low voltage heavily loaded downtown areas. Several companies already have their own CO^2 fire extinguishing equipment. Water often does more harm than good and sand generally leaves molten slag to be removed before repairs can be started. CO^2 gas is fast and efficient and is generally conceded to be the best medium for extinguishing manhole or duct line fires. It expands three ways, cools and stops combustion even of energized cables and leaves nothing in the way of making quick repairs.

Some companies have their equipment mounted on trailers, some on skids for quick loading on any available truck and some are equipping all substations with readily portable but smaller units.

Network Systems

Our English engineer friends tell us that more trouble is experienced in bomb-torn London by the water and gas systems than by the underground electric systems.

They have found that the grid or network system is the answer to providing interrupted service, because when an explosion occurs, workmen cap the ends of the cables at each side of the hole and allow service to be supplied from either direction until such time as the hole has been filled, water and gas lines restored and it is possible to reinstall their cables in the original location.

A number of short cuts are being studied with a view to materially cutting down the length of time required for restoring service after a fire or explosion.

Quick Setting Joint Compounds

The Research Laboratories of several companies are working on quick-setting compounds for temporary joints. Several compounds so far appear to be very promising and it is expected that in the near future we will have a material that will make it possible to make a quick although non-submersible joint on a cable in a real emergency, so that the cable may be put back in service within a couple of hours after work is started on the joint as compared with six or eight hours under normal conditions.

There are two general types of materials being studied, one of which will require heat for solidification of the compound and the other known as a cold-setting compound that employs two chemicals which solidify due to chemical action.

Cable Standardization

Because of the fact that over the years, companies have for reasons peculiar to their own system, adopted special conductor sizes, insulation thickness and lead thickness, we find that the industry as a whole today is buying a large number of such different combinations for more or less the same class of service. A sub-committee is now working on this subject with the object in view of reducing the total number of sizes, insulation thickness, lead thickness, etc., and more or less standardizing so as to limit stock requirements of the utility, and tools, dies, etc., of the manufacturer. It is expected that considerable good can be accomplished by such standardization.

As an example, it looks as if perhaps 50 combinations might take the place of about 175 combinations now in use.

Increased Transformer Loading

Transformers are limited only by temperature and regulation in the amount of load that they will safely carry. Normal loading values are established to cover the most adverse conditions of operation. Such transformers are seldom installed with artificial cooling, thus in emergencies such values may be materially increased by artificial or special cooling methods.

Pole top transformers do not readily lend themselves to artificial cooling but considerable work has been done toward improving the situation as a result of studies made on the effect of various paints on the temperature of line transformer cases.

Recent studies by the E. E. I. and manufacturers in joint committee work have determined a curve showing the expected reduction in life with overload. During the emergency period it will be possible to take advantage of the fairly large overload capacity of such transformers by loading them even though life is shortened and it is necessary to replace them after the emergency period. Studies in the shop maintenance of transformers indicate that savings in manhours and a more efficient use of existing equipment are quite possible.

Increased Aerial Line Loading

The capacity of overhead lines is generally limited by voltage drop rather than current carrying capacity. Most distribution lines are designed to handle a considerable amount of emergency loading over and above their normal load. In general, heavy industrial power circuits or substation feeders are designed for a 10 per cent line and transformer drop at normal maximum load. A greater tolerance in voltage drop would allow a very material increase in the power carrying capacity of such circuits. In a real emergency when construction materials are not available and if the public can be educated to the necessity of accepting sub-standard voltage conditions and longer time outages in the event of trouble, it will be found that most of the distribution aerial lines of the country will stand a very material increase in load over that normally considered maximum under the high standards now in existence.

Power Factor Correction

Capacitors for power factor correction are devices that require very little raw material now listed for priority in defense work. It is entirely possible with the use of shunt and series capacitors for overhead lines to be "tuned up" so their limit of load capacity is determined by current limitations only. Impedance drop can be practically eliminated. This effect can be very far reaching because it will not only eliminate most voltage drop problems on overhead lines but will release capacity all of the way back to the coal pile by improved power factor on all portions of the system.

One company installed 14000 kva of shunt capacitors and found the entire expense was justified by the released capacity in the distribution system alone to say nothing of the released capacity in generating stations and the improvement of voltage conditions throughout the system.

Installation of a series capacitor was made on an extremely long overhead industrial feeder with the result that the reactance of the line was practically eliminated. The customer's former load of 3500 kva had been approximately full load on the circuit. After installation of the capacitor, at least 6000 kva of usable

capacity was made available to the customer.

Boosters

Boosters in the form of step regulators are another useful item in the answer to the low voltage problem resulting from increased loading of aerial lines. Many long radial overhead lines are already so equipped. Standard pole transformers connected to give permanent voltage boost are easily installed and will also be of great help in many cases where the voltage resulting from emergency loads during heavy load periods is below the minimum required for operation and where the condition of some over voltage during light load periods can be permitted.

Increased Mechanical Loading of Poles

From 20 per cent to 30 per cent of all poles now installed in overhead lines are oversize due to methods of grading to meet specifications and a leniency in engineering design, and there is no question but that if pole lines were actually measured in the field, we would find larger poles than minimum design standards require, thus allowing much greater loads to be installed during the emergency without replacement.

Most pole lines are weakest in a direction transversely to the line. In such cases additional circuits could be accommodated with the addition of side guys. Present high ground clearances could be temporarily reduced during the emergency and allow additional circuits to be installed without pole replacement or other large changes.

Mobile and Temporary Substations

Several companies have already purchased mobile or other easily portable substations for emergency use.

Others have designs already made and equipment spotted for quick assembly when the need arises.

Many companies have made a practice of using single phase transformers and installing a spare in their large important substations.

Some companies contemplate the use of pole top switches, fuses, lightning arresters, etc., mounted on low wood structures and outdoor transformers all enclosed in a chicken wire fence for quick installation where needed.

Rearrangement of Circuits

By revising the present high standard of operation it will be possible to rearrange distribution circuits and greatly increase their load factor without the installation of additional new switchboard positions in existing substations. The use of series and shunt capacitors as above mentioned will also greatly increase the amount of load that can be carried by present substations.

Radio Communication

Quick restoration of service is of prime importance at any time but it becomes of even greater importance when emergency circuits are taken over for normal loads and high quality automatic emergency throwover devices are out of the picture.

At such times and when fires or storms are raging, the quicker men can get on the scene, the less damage is done and the quicker service can be restored.

One of the greatest advances toward that end is in the use of radio for emergency dispatching of trouble and line crews.

Shortly after one company had inaugurated their emergency short wave radio system, a fire occurred on a river bridge over which ran the two power lines and the telephone cables serving a large area. The fire disrupted all power and phone communication for miles and without the radio, restoration of electric service would have been held up for many hours. Instead, line crews working in several places on both sides of the river were in constant communication with each other and the Stores Department. One of the lines was back in service in 29 minutes. New poles were installed and the other line was back in service in less than three hours.

Materials

Distribution engineers use a great deal of steel and aluminum and other nonferrous metals, particularly zinc for galvanizing, and find themselves in the position of having to use substitutes due to the fact that the government has taken over steel and practically all of the nonferrous metals. The steel situation may become critical and it may be necessary to revert back to the use of more wood and other substitutes for transmission lines and substation construction.

Experiments now under way indicate that materials for painting have been found that seem to offer almost as good protective characteristics as galvanizing. Magnet wire enamels have already been completely developed that are so tough they will stand very considerable mechanical damage before exposing the wire and it is expected that such coatings will be used in many places on the distribution equipment where a protective coating for metal is required.

Emergency Stocks

The question of emergency stocks of material is of vital importance at this time, not only because of possible price increase but primarily because of raw material shortage and extended deliveries and the importance of having on hand an adequate supply to take care of any emergency that might exist.

Selection and Training of Employees

Distribution people are finding themselves confronted with the necessity of replacing and increasing their skilled personnel. The draft, National Guard, and Naval Reserve are taking men out of key positions and more will be taken as the defense program progresses. Filling those positions will become increasingly harder as time goes on. It is a real problem, not only in the utility business but all over the country and will undoubtedly be relieved only by the training of new personnel or arranging with governmental authority to leave such men in their present important positions.

The selection and training of personnel has reached the point where it is now practically a science and one of our sub-committees is making a study from which recommendations of real value are expected.

Sabotage

The subject of sabotage has come in for a great deal of very interesting discussion in closed meetings. Distribution engineers are well aware of the situation with which they are confronted and are taking steps to protect their properties.

Conclusion

The resourcefulness, thinking and general ability of the utility engineers of the country has kept them very flexible. Not once has there been a note of pessimism or defeatism heard at any of our meetings. On the other hand, there has been a very definite feeling of optimism. They have so kept up their systems during normal times that they are ready now to do their bit in the national emergency with which they are being confronted.

They see no reason why they can not handle any amount of load that the defense program may require.

During the last war, the slogan of the army engineers was, "It Can't Be Done But Here It Is."

I honestly believe the distribution engineers of the electric utilities should use the slogan, "It Can't Be Done But We Do It."

A Forward Look At Distribution

By M. W. Smith

Vice President in Charge of Engineering, Westinghouse Electric and Manufacturing Company, Pittsburgh, Pa.

Address before the Second General Session of the Ninth Annual Convention of the Edison Electric Institute, Buffalo, N. Y., June 3, 1941

EXTREMES naturally attract the most attention—be it the fastest automobile or airplane, the tallest building, or the freak at the circus. This is a natural human trait and is a characteristic that possibly influences our perspective of the various components of the whole power system. The big central power station with its sleek modern units of 50,000 to 150,000 kw naturally has a lot of glamour and has had a tendency to overshadow the remainder of the system. There is a great thrill in planning and building an efficient generating plant for all the world to visit and admire. With its tremendous lump investments, the generating station has probably received greater initial planning effort and more sustained attention and direction than the more prosaic distribution system. The power station entails an investment of around $100 per kilowatt of installed capacity, but the distribution system, where perhaps twice as many dollars per kilowatt of load is involved, although built up on a general plan, is based in detail on day to day decisions made by everyone from the engineers in the operating and distribution divisions down to the line foremen.

Yet reduction of distribution costs is one of the most pressing problems facing the utility industry today. The distribution investment has gradually increased so that it is now more than half the total investment of the industry, and the carrying charges on this investment are fast becoming the largest single item of cost of electric power. Fortunately, utility engineers fully appreciate this problem and are devoting an increasing amount of their attention to it.

At this time, when loads are increasing rapidly, it seems opportune and desirable to give careful consideration to future distribution investments, not only from the standpoint of immediate cost but particularly from the standpoint of flexibility and adaptability to meet a long-range program. Generating stations are fixed in their location by fuel and water availability and will continue

MR. SMITH

to be usable regardless of future load dispersion. Such fixed limitations do not apply to distribution systems. Moreover, changes in load requirements create the necessity for frequent system modifications and changes in the location of equipment. This makes it particularly desirable to avoid as much as possible tying up properties and equipment to fixed locations.

Distribution systems, too, have also been subject to what I said about extremes. In the early nineteen-twenties, the industry found a need for a radical change in the method of supplying highly concentrated city load areas. More recently, great improvement has been made in methods of rural distribution. If we look forward to the next ten years, I believe that much of our effort will need to be applied to that part of the distribution system that lies between these two extremes.

This "middle class" comprises areas such as small business districts in urban communities, business districts in small towns, high-class residential areas and the like having a load density of from 500 to 5000 kva per square mile in contrast to the 100,000 kva per square mile in the larger metropolitan areas and 10 kva per square mile in the lighter rural areas. These areas do not have a load density high enough to justify the downtown type of alternating-current network but are being subjected to continued load increase that is tending to exceed the economical limitations of the simple radial system. In planning improvements in these medium load areas, we should heed the warning the late Mr. H. R. Woodrow made in a paper presented before this convention a year ago, in which he stated that " 'Tiffany' service costs more than John Q. Public wants to pay." From a manufacturer's viewpoint, such an objective can be accomplished only by the use of simplified and standardized equipment made in production quantities.

I'd like to talk about these "middle class" systems for a while—not as an expert distribution engineer, for I do not pose as such—but as an interested observer and representative of a manufacturer that recognizes that your problems are our problems and that we can all benefit by working out their solution together.

Our problems of distribution sum up about this way. As the load increases, our mutual job is to utilize the existing investment most effectively and to provide means for expanding it economically. Instead of making sweeping revisions in the existing systems, the better method is to make additions here and there in small increments to eliminate localized bottlenecks as they develop with load growth. To illustrate concretely what I mean, I wish to discuss briefly several specific examples. They are not final solutions nor definite recommendations but are intended to stimulate thought and action by bringing out certain conditions, trends and future development possibilities.

In considering this middle class load area, something should be done to eliminate the disadvantages of supplying load from single isolated transformer banks —which are inherent in the common

radial system of distribution. The desirability of tying together distribution secondary leads has been appreciated for a long time because such an arrangement diversifies the load on transformers, improves voltage regulation, and reduces the possibility of light flicker complaints.

It is much like bringing to these distribution systems the same advantages that were brought to power systems years ago by station and system interconnection. However attractive this idea of paralleling distribution transformers may be, it has not been actively pursued because adequate equipment that would remove some of the practical operating problems and still meet low-cost requirements was not available. It now seems possible to surmount these difficulties and limitations by adopting high production parts developed in recent years for other purposes, and applying them to uses I shall mention later.

In these medium-load areas we are concerned with two types of distribution. The first type is the single-phase supply to residential and very small business centers, and the second type is the three-phase supply to the larger business districts.

Let us first consider what might be done to the ordinary singlephase system. In most cases it consists of a single-phase branch feeder, usually 2400, 4800, or 6900 volts, to which distribution transformers are tapped at intervals of a few blocks. The low-voltage secondaries extending from these transformers meet about half-way between transformers, but are not connected together. This connection is not made because a severe secondary short circuit will cause the nearest transformer fuses to blow, thus transferring the overload to the next units and so on until transformer fuses are blown successively down the street, like tipping over a row of dominoes. To prevent this so-called "cascading," additional fuses have sometimes been employed to tie these secondary leads together.

However, this method of paralleling single phase transformers located along residential streets has not been popular because of the difficulty experienced with fuses. Fuses are hard to coordinate with the ability of transformers to carry overload, there is no indication of their being blown, and if frequent fuse blowing occurs, linemen, in effect, put a penny in the fuse by tying the secondaries through solidly and risk producing cascading if real trouble takes place.

The inherent advantages of operating singlephase distribution transformers in parallel can be realized by a new scheme of banking transformer secondaries. It requires using low-cost circuit breakers matched to the transformer characteristics instead of the troublesome secondary tie fuses. A suitable low-cost breaker is now available and is being built on a quantity production basis in connection with the development of the self-protected distribution transformer that has come into such general use within the past five years. It appears feasible to install a second circuit breaker of this type in these self-protecting transformers for the purpose of breaking up the secondary during trouble and in this way localize the disturbance by, in effect, removing a domino from the row. By placing this second breaker within the transformer tank it can be properly coordinated with the overload ability of the transformer while the present circuit breaker is used to obtain self-protection. It should be noted that with this arrangement, the secondary tie point is moved to the transformer.

The paralleling of distribution transformers by any of the foregoing methods is frequently called "banking." The twin circuit breaker type of banking transformer can also be inserted between two of the existing conventional transformers that are already in service to provide for local growth, and at the same time permit the secondaries to be paralleled. Experimental models of the kind of equipment I have just mentioned have been built and tested, and they show promise of meeting both technical and economic requirements.

We may now consider possible improvements to the three phase distribution used in the more heavily loaded community business centers, where an interruption of service to shoppers and movie-goers on the Saturday night following payday would be embarrassing. The three phase network system so successfully used in metropolitan areas is desirable but too expensive for this class of service. Therefore some less expensive network method must be sought. At present in these community centers separate isolated transformers and secondary mains for the power and lighting loads are ordinarily used to avoid light flicker. For reliability, at least two feeders are commonly brought into the area with manual throw-over arrangements in case one feeder is in trouble. Thus we have available most of the elements for creating a light-duty, low-voltage network with the exception of an economical network protector, and this is now in the hands of our devleopment engineers.

The distinction between the single phase area power supply and the three phase business section power supplies is that the latter requires at least two feeders for reliability. The paralleling of the secondaries of transformers that are tapped off different feeders to form a network presents problems that do not exist in the previous case of banking single phase transformers where all units are tapped off the same feeder. With two feeders supplying three phase network transformers, a short circuit on one feeder will open its substation breaker, but this operation alone is not sufficient to remove the fault. The good feeder and its transformers continue to transmit power to the network, resulting in reverse flow through the transformers attached to the feeder in trouble. To completely clear the fault, each of these transformers must be disconnected from the network by action of reverse power devices in associated network protectors. The network protectors that are needed for this purpose are the heart of the three phase, light duty network system that is considered desirable for supplying important community centers.

The metropolitan networks which we have already agreed are too expensive for the locations we are considering are supplied by four to twelve feeders, with transformers from 225 to 750 kva, so that in the event of one feeder being out of service, the load on the others is still low. In the lighter density areas, we must change this conception of a network and use only two feeders with 15 to 100 kva transformers arranged so that if one feeder is out of service, the other can carry the whole load over a peak period. The excess transformer capacity to meet these overloads can be kept to a minimum by loading the transformers on a copper temperature basis. This method, together with a simplified form of network equipment, should produce a system comparable in cost with the present radial system. Such a network can supply both motor load and lighting load from the same secondaries due to the improved regulation over the radial system, thereby reducing the number of wires on the poles and minimizing the likelihood of these pole lines being forced under ground by ordinance.

It is recognized that low cost, light duty network equipment must be made available if the advantages of network

service in these low density areas is to be realized. As manufacturers, we have been investigating this problem with a view of again utilizing parts of equipment now in high production for other purposes as a means of keeping both development and manufacturing costs to a minimum. One such possibility is the use of molded parts from industrial air circuit breakers. Although commercial equipment is not available, we have built models that look promising, and feel that in cooperation with the utility engineers, an economical distribution method particularly adaptable to continuing load growth in these smaller communities can soon be developed.

The loading of transformers on the basis of copper temperature is an essential factor in making such a light duty network practical. There is a well-established background for this practice, of which the self-protecting transformer with its built-in thermal breaker is representative. The fact that 60 per cent of our present distribution transformer production is now of this type is indicative of the strong trend toward loading by copper temperature.

These same principles that first became established in the distribution field are now being applied to the larger substation class apparatus. This has resulted in a way of performing the substation functions by means of self-contained transformer units incorporating automatic voltage regulation and a reclosing circuit breaker. These self-contained units, rated from 500 to 2500 kva, are readily moved from place to place and can be located at points where the load develops, without tying up more than around 5 per cent of the investment in location expense. These units can be used as additional substation capacity, and may have feeder ties to existing substations or other unit-transformer substations. Also, by the use of a breaker in the middle of these ties, an economical primary network can be created. These completely self-contained substation units can be set up in the short space of one or two days. In one case, what was part of an oat field at seven o'clock in the morning was a substation serving load by dark. Where applicable, it is believed that this form of equipment will give the greatest possible flexibility in fitting the primary part of the distribution system to the fast shifting loads that are being experienced at the present time.

Long-term predictions are hazardous but if one observes the trends of expansion in industry it becomes apparent that the tendency is to discontinue the development of large centrally-located manufacturing plants. This is a further indication of the likelihood of expansion of distribution systems for the medium load areas. To obtain efficient and effective operation using modern production methods, the most economical size for a plant seems to range from 1000 to 5000 employees. As a part of this trend, we may expect a long-term movement of people from farms to such communities. From common observation, farms are nowadays being more efficiently handled and fewer farmers are needed to produce our food requirements, while at the same time there seems to be an inexhaustible desire for the products of our factories, even on farms. All of this means that the continuing growth of medium-sized communities having from 10,000 to 100,000 population may be expected in locations where good transportation facilities are available.

The system developments considered thus far were based on the use of well-known materials. But there is another approach—the development of something fundamentally new. For that reason we must always keep an eye turned toward the research laboratories, for one never knows when there will emerge some new development that will strike a body blow at some tough problems. Precisely that has happened in the transformer business. During the past year the results of ten or more years of development on the part of engineers, physicists and metallurgists associated with the steel and electrical industries culminated in a new type of transformer iron. This iron can carry up to one-third more flux at normal magnetizing forces as a result of special grain orientation obtained in the rolling and heat-treating processes. It is now being produced in commercial quantities and in the case of our own organization, our transformer manufacturing facilities are being entirely rebuilt to utilize the advantages of this new product.

At present, this high permeability silicon iron costs about twice as much per pound to produce as the conventional silicon iron but we can use less of it, with a resulting transformer that is both lighter and better electrically from the standpoint of the system of which it is a part. It has given transformer designers a valuable tool enabling them to design transformers especially adapted to the new distribution methods that we have been considering. These transformers can be built with lower temperature gradients which result in the inherently greater short-time overload capacity that is needed for the two-feeder type of simple network. What is equally important, their voltage regulation can be improved sufficiently to utilize this added capacity.

When any product such as a transformer can be built smaller, there are inherent savings to the user in the storing, handling and mounting of the lighter unit. Pole tops will have a neater appearance because tanks are smaller, and a cross-arm can be eliminated by including the equivalent of cutouts and arresters in the self-protecting type of transformers. Savings will also result from mounting the larger kva transformers without the use of special platforms.

This ability to build transformers in smaller dimensions fits in with the desire for underground construction in the new high-class residential areas. One promising scheme now being tested consists of placing a standard transformer with minor modifications in a shell buried in the ground, eliminating any costly vault construction. The air space between the transformer and the shell is the essential element in transferring the heat to the atmosphere. The earth is not relied upon for heat dissipation because as it dries out, it becomes a poor conductor of heat.

To obtain the full benefit from modern production methods, a greater effort should be made to crystalize and coordinate some of the strong individual opinions that have developed during the rapid growth of the electrical industry. Both the manufacturer and the utility users of equipment benefit by standardization. Also, both of us benefit by any fundamental developments that can be made in materials. An outstanding example of the benefits derived from these two items is the static capacitor having wide acceptance today for the release of system capacity or the improvement of voltage regulation to better serve your customers and make better use of your existing investments. In the past fifteen years we find that the size of capacitors has been greatly reduced and that the cost is at the present time approximately 40 per cent of the 1930 figures. This is a good example of how improvements in materials and the acceptance of standardization by the operating companies has resulted in material saving to you, still allowing the manufacturer to make a reasonable profit on his product.

Obviously, we do not want to advocate the standardization of apparatus and systems to the point that the designers' initiative and imagination will be restricted. If we go too far, the major advances such as the fundamental improvements in transformer iron previously mentioned would not be encouraged or used to advantage. On the other hand, such items as terminal arrangements, methods of mounting, taps and the like can readily be standardized to the advantage of all concerned.

The telephone companies have long been leaders in standardization and have profited extensively by using its principles effectively. Perhaps the power industry could study with profit some of the lessons they have learned. Perhaps, for example, it might be possible to arrive at a standardization of fewer voltage classes with greater rating standardization and more uniform structural standardization.

It is obvious that each distribution problem must be given special consideration and individual treatment, depending on local conditions. Some of the suggestions I have proposed have necessarily been rather specific so as to indicate actual possibilities by way of example. To summarize briefly, it appears that there is much that can be done to improve service and lower costs in the middle class zone of our distribution system which is so tremendously important because it is a large and rapidly-growing part of the total distribution load and investment. We have looked at several specific possible courses of action.

1. Greater flexibility to meet shifting load requirements is needed. To this end, the portion of the expense tied up to specific locations should be kept to a minimum.

2. Future system modifications and extensions should be planned so as to increase investments in small increments as local bottlenecks develop. Large expenditures for applications such as substations where the equipment may remain lightly loaded for a long time until the load builds up, should be avoided. This makes self-contained, small unit substations with low installation costs attractive.

3. Because of the expansion predicted in middle class communities and suburban districts of large cities, it is doubly important that improved distribution systems for medium-load areas be developed. Two such improvements are in sight. For single-phase residential areas, a new form of banking transformer that permits the realization of the advantages of parallel operation looks promising. For the accompanying community business centers, a light-duty, low-voltage network supplied by only two feeders has possibilities.

4. There are, in addition to the more conspicuous advanced ideas in system arrangement, many individual improvements brought to us by research and development engineers which in the aggregate add up to a surprising total. Included in these developments which may add to the improvement of distribution systems are such items as the peak overloading of transformers through the practice of loading on the basis of copper temperature; new materials and products like the new transformers with high permeability iron having improved characteristics that permit better coordination with present system needs; greater observance of the principles of standardization so that the full benefit of modern production methods can be obtained.

Much of the progress in the past has been due to the willingness of the utilities of this country to experiment with new developments which showed promise of benefiting the industry as a whole, and I am sure that our combined and coordinated efforts of the future will lead to further improvements in distribution methods of such importance that we can look forward to the time when we may approach "Tiffany quality at a price John Q. Public can afford to pay."

Load and Capacity

(*Continued from page* 252)

tion and then real scarcity of metals, chemicals and other materials to be consumed in production processes—copper, zinc, nickel, aluminum, steel, etc.

In these times no one can foresee all eventualities. We would do well to remember the strong statement of Mr. Bernard M. Baruch, Chairman of the War Industries Board in World War One, before a Congressional Committee in March of this year. He said:

"The demands of total warfare upon a nation's economy have become overwhelming. Even in the United States, with its present excess capacity and its unemployed reserves of labor, the requirements of an all-out rearmament effort are large enough to tax some industries beyond their limit, and the unfolding of the full-fledged program appears now to be rapidly extending this condition to the whole industrial structure."

In his book, "Save America First," Jerome Frank, former Chairman of the Securities and Exchange Commission, wrote:

"America wants results. And if the results it wants can be attained by modifications of our habitual economic and political arrangements, there is no need to ask for more extensive changes. The major obstacles to the results America wants is not basically the concentration of economic power, but the unintelligent, socially harmful use of that concentrated power. And a program which will yield an intelligent use of that power under a political democracy should satisfy us."

If Mr. Frank in this statement has correctly sized up what America truly wants, the electric utilities to a very large extent have in their own hands their future place in America's economy. They have created the facilities and they have the organization to supply the great bulk of the power requirements of America. It is to them that the nation is really looking to carry out this present task of furnishing an adequate power supply for the rearmament program. The up-to-the-minute record, as depicted in part by the charts just presented, shows that notwithstanding obstacles and handicaps both inherent and man made, they have risen to the task and clearly indicates that they will muster whatever is necessary to see it safely through.

Electric Service Values

(*Continued from page* 260)

we will need a re-generative force, but we must be still in sales motion when the challenge is given.

Must we not establish some measure of economic self protection today with due consideration for the complexities of defense efforts?

Granting that the idea of "Business as Usual" is going out the window as it did in 1917, does that mean that we should allow the constructive work of the past decade which has helped to weld increased sound consumer-business relations, and promoted more intelligent consumer buying, to be erased by the exacting demands of warfare? We have established a practical cooperation between units of business and are carrying the concept on to consumers of electric service. We expect them to be with us when the horrors of conflict are past.

Let us not forget that "Out of sight—out of mind" is an axiom that is applicable in our industry, as it has been found to be in all others. Mr. Arthur Page, Vice-President of the American Telephone and Telegraph Company, says, "Ninety per cent of your business is what you do—ten per cent is telling what you do." The internal economic health of the electric utilities demands that the electrical industry does not falter in telling the civilian population, through national coordinated promotion, the benefits of electrical equipment and its utilization, whether in home, commerce or industry. This should continue to the extent justified by the availability of service and equipment. Then—and then only—the challenge of the post-war period will not be a race from scratch for electric utilities, manufacturers and the dealers of all trades. Through association leadership, national promotion in education, social and economic enlightenment of the public is not only advisable, and productive of common good, but in effect, it is a vital element in our American democratic life.

Some Present Engineering Opportunities in Electric Distribution

By A. E. Silver
Ebasco Services Incorporated

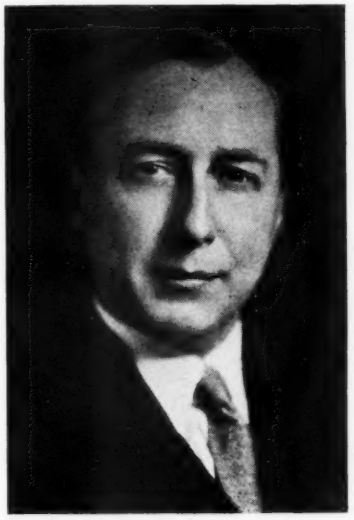
Address before the Second General Session of the Ninth Annual Convention of the Edison Electric Institute, Buffalo, N. Y., June 3, 1941

IN his excellent address, "A Forward Look at Distribution," Mr. Smith has provided an illuminating look around the corner at electric distribution needs and trends of tomorrow. He has covered this phase so fully that there appears to be little for a discussor to elaborate.

Mr. Smith has aptly emphasized a pressing problem facing the electric utility industry today—that of controlling distribution costs, and has related this to the service adequacy, rather than the "gold plating" of service, that John Q. Public is willing to pay for. This reality is made more impressive by the present rapidly increasing power requirements for national defense activities and by the fact of the rapidly mounting portion of John Q. Public's dollars that are destined to go directly to government to pay for these defense activities.

The distribution systems of the United States, at present, are being called upon to deliver energy at customers' premises in an aggregate more than 15 per cent ahead of one year ago, and this rate appears to be accelerating. Construction expenditures for electric distribution in the United States during 1941 are estimated at approximately $300,000,000—probably as much as will be expended on all other parts of these power supply systems combined. The distribution engineer, perhaps more than any other, is "on the spot." Conservation and economy call upon him to find means of making facilities, already built for rendering service to more than 30,000,000 customers, do more work at lower cost per unit.

It may be worth while and timely, therefore, to review some of those more recent engineering developments that frequently are yielding increased capability of existing facilities, increased economies in operation and lower costs for new extensions. These practices are based upon sound engineering principles, and any gains, even though spurred by the exigencies of abnormal activities, it is believed, will be enduring. Probably none of these practices which I shall mention are entirely novel, neither so widely established as to be termed conventional; however, their application should accelerate the trend to lower distribution investment, in terms of product delivered to consumers.



MR. SILVER

Higher Voltage Primaries

Experience in numerous locations, varying in climatic conditions and service requirements up to the most severe, has proven the feasibility and economy of distribution primary voltages of 7200 and 7620 phase-to-neutral. (These correspond to 12,500 and 13,200 volts phase-to-phase.) Line voltages of from 11,000 to 14,000 have been widely used for sub-transmission systems serving distribution substations which convert to primary voltages of 2400 or 4160. In numerous cases where it has been necessary to increase capacities of such distribution systems, it has been found more economical and effective to take load growth directly on the intermediate 12,500 or 13,200 volt circuits, thus utilizing these as primary systems, rather than to increase the capacities of or build new distribution substations and increase the number of feeders at the 2400 or 4160-volt level. Furthermore, the benefits of eventual elimination of all the facilities and losses incident to one entire voltage level are significant.

Bare Conductors

Weatherproof-covered (sometimes erroneously called insulated) primary and secondary conductors cost from 20 per cent to 40 per cent more than bare conductors of the same conductivity. In addition, bare wire has the advantages of increased safety from more positive de-energization under fault, of less burning under arc, also of being less subject to damage by wind and ice. Also it is not subject to occasional replacement on account of disintegration of covering. A Bare conductor never festoons.

Common Multi-Grounded Neutral

The wye-connected primary system with multi-grounded neutral common with secondary neutral may save up to 50 per cent of the secondary copper along primary poles, by eliminating one secondary wire. It provides a more effective and safer grounding system. It is suited to transformers with one primary bushing and one set of protective apparatus, whereas single-phase installations on a delta-connected primary system require two primary bushings and two sets of protective equipment per transformer.

Bringing Rural Construction In-Town

Development of distribution facilities, both in the built-up and in the rural areas, has been one of evolution. All during the early years this development naturally was directed to serving the urban areas. Next these circuits began to stretch through the outskirts into the nearby rural zones, but the designs were too heavy and the costs too high to penetrate economically very far into the truly farm areas.

Then came a fresh engineering attack bringing simplified, lower cost distribution lines fitted specifically to the rural conditions and needs. A higher primary voltage permitting light high-strength conductors and light poles—with wires, transformers and other accessories attached directly to poles, without the medium of crossarms—were brought to bear. Line coverage for an entire area was planned in advance with a minor length of three-phase backbone circuit supplying a maximum percentage of simple low cost, single-phase laterals or branches.

The adequate service results experienced from these truly rural lines, their largely improved appearance without crossarms, and their simplicity generally has caused this design to start moving in to town, with benefit from the lower cost and more public favor. This fits well in residential areas where, by good engineering planning, a large percentage of circuit mileage can be in simple single-phase laterals of this type.

Coordinated Breakers and Branch Fuses

It was not so many years ago when disabling damage from a fault on a distribution circuit was taken as a matter of course, with splicing of burned-off conductors and probably other repairs necessary to restore service. Careful analysis of outage experience, however, showed that only a minor percentage of faults need cause prolonged outage if the fault is removed quickly enough to prevent thermal injury from the flow of power current into the fault. This is true of nearly all faults that originate from lightning strokes. Sprouting from this knowledge has grown the now extensively applied automatic reclosing of circuit breakers.

However, even with the present perfection of the automatic reclosing circuit breaker there still remains that minor percentage of cases where the circuit "locks out" and must be held off until repairs can be made, such as from a tree falling across the line, automobile collision or other strenuous encounter that cannot be guarded against. For dealing with these cases the simple single-shot type of primary fuse, installed at branch circuit junctions and coordinated with the automatic reclosing main circuit breaker has much merit. The function of the single-shot fuse is to select and isolate the specific branch that is disabled, thus clearing all other sections of the circuit for being returned to service automatically. The sequence of operation when line fault occurs is—First, for the feeder circuit breaker automatically to open and reclose in a very few cycles, usually successfully maintaining service with no more than a scarcely noticeable voltage dip. Second, if a permanent fault is encountered, a deliberately timed device delays the main circuit breaker in the second opening to allow time for the single-shot fuse, in that branch of the circuit where the fault exists, to blow. Whereupon the main circuit breaker again recloses automatically to restore service on all but the isolated branch in trouble, with an interruption of only a few seconds. This type of branch line fusing coordinated with fast reclosing of main circuit breakers is particularly useful in connection with the higher voltage primary to permit the serving of larger territories by individual feeders. Service to customers is improved, maintenance expenses are reduced and existing facilities can be extended for increased service of entirely adequate quality.

Capacitors

Another device that is rapidly growing in use for improving the effectiveness of system facilities is the static capacitor. Static condensers long have had limited application for power factor betterment. These earlier ones were of the indoor type, used principally by the larger industrial customers, were high in first cost, and frequent failures in service were experienced.

Capacitors as recently improved and adapted have been applied by utility companies with a marked degree of success directly on distribution circuits. Failures in service have been insignificant. The condenser of yesteryear has been dressed up with an improved dielectric, made capable of withstanding high voltage surges and sealed in a convenient case for outdoor pole top mounting. An aggregate approximating 1,000,000 kva of these capacitors is now in service on utility systems.

The standard units are of 15 kva each, of interchangeable mounting for all makes and nest compactly for either single-phase or three-phase installations on residential, commercial or industrial feeders. Advanced knowledge of dielectrics, improved manufacturing methods and mass production have provided the modern capacitor at a price to earn wide application for improving power factor, also for increasing circuit capabilities by neutralizing reactive kva, raising voltage levels and reducing losses.

This latter benefit from capacitors, i.e., reduction in power and energy losses, is being found very considerable under some conditions of system design and loading, frequently extending beyond distribution circuits back through transmission and generating facilities.

Standardized Equipment and Practices

Standardization is of great importance for reducing construction, maintenance and operating costs. While it must not be permitted to throttle sound progress in the development of new ideas, there is large practicable advantage to be gained from promoting unified equipment designs and practices. Systematized mass production is the American way of effecting low costs.

Simplified Meters. An example of the value of standardization is the results from the accomplishment, a few years past, of industry wide standardization of service meters as regards ratings and mountings. Mounting arrangements by the hundreds were in use. Mounting interchangeability for all makes was worked out. Manufacturing, stocking, installing and maintaining of meters, all were simplified. While further standardization of meters may be forthcoming, present metering costs would be materially higher except for the effective work already done in meter standardization. Undoubtedly there still is opportunity for cost saving by more nearly universal application of present standard meters and metering practices.

EEI-NEMA Standard Distribution Transformers. Five years ago the habit had become widespread among utility companies to purchase "tailor made" distribution transformers for overhead line service. Individual companies were freely specifying features special to their own situations. Manufacturers were being hard put to maintain anything like quantity production of the units that each saw fit to catalogue as its standard. Price increases appeared to be imminent.

Actuated by this situation, a joint committee of Edison Electric Institute and National Electrical Manufacturers' Association has been working for nearly three years with the objective of searching out essentials in distribution transformer requirements and developing a basic standard for the guidance of both manufacturers and users. In particular, mechanical features and mounting provisions have been concentrated on. The result is that new EEI-NEMA Standard Transformers are now available

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Conservative Investment for Electric Distribution

By E. S. Fields

Manager, Electric Department, Cincinnati Gas and Electric Company, Cincinnati, O.

Address before the Second General Session of the Ninth Annual Convention of the Edison Electric Institute, Buffalo, N. Y., June 3, 1941

OPERATORS of electric distribution systems are appreciative of the continued efforts of the electrical manufacturers in developing new equipment for distribution use. We particularly recognize the value of the advancements and improvements that have been made possible through research and engineering, and the development of transformers, protective equipment, and accessories. The research and development testing of the manufacturers have aided in our understanding of the possibilities, as well as the limitations, of this equipment.

Engineers for the manufacturers, through contact with engineers of the utilities, have an unusual opportunity to correlate suggested ideas of individuals and advance them to a broad basis of acceptance. Further, the cooperative spirit of the manufacturers in dealing with both the individual utility engineers and the E.E.I. technical committees has facilitated greatly the standardization of many details that lead to economy in equipment utilization.

Mr. Smith mentions in his paper several new developments and some others to come. I have been asked to supplement his view of distribution with my ideas from an operating position.

It is recognized generally that the keynote of our distribution operation now is to make the most possible use of our present investment. Construction and operation of these systems offer a wide range of possibilities for ingenuity and engineering. Present day distribution practices are based on the same type of skilled engineering judgment that we apply to our generating stations and main transmission systems.

New equipment, new devices, and new methods are important, but they should be applied and used only if they pass the test of sound economics and necessity for the particular system condition. We can afford to add to our investment only to carry more load or to improve some condition which cannot be helped by changes with the present investment.

MR. FIELDS

I do not mean to imply by these comments that there is not a place for each of these new devices, but I would emphasize that they must be applied by each operating company on the basis of local conditions, experience, and service requirements. We can well ask, for example: Are we justified in banking secondaries or applying the network principle in an area that has an average of one service interruption in two years? Are our customers willing to pay for this investment to prevent that one interruption? If, on the other hand, such plans do give improvement in reliability at a cost comparable with the present system, they are justified. Or, if there is a bad operating situation due to a local condition, one of these plans may be justified on the basis of comparison with other possibilities for improvement.

Distribution costs are less today per kilowatthour than they were ten or fifteen years ago and this trend should continue for a while at least, since more kilowatthours are being delivered over the lines. After the service is available the cost does not increase in direct proportion to the increase in energy delivered. One of our industry's major problems today, and it appears it will be with us for some time to come, is to continue this increase in the sale of energy without increasing proportionately the investment to serve.

It would be quite possible, and it might be a very pleasant task, to double our present investment in distribution. No one proposes to do this, but it is mentioned to emphasize the point that no increase in investment is justified unless it is accompanied by a profitable increase in energy sales or is applied to a system that has not been developed progressively to keep pace with the service requirement for the present load condition.

About ten years ago the manufacturers and utility engineers gave united attention to grounding conditions on our distribution lines. After many trials and tests, interconnection of grounding at our distribution transformer installations became generally accepted practice. The change was not spectacular and it was added as one of the functions of the maintenance and operation crews without the purchase of new equipment. In a similar manner, primary fuses with improved characteristics were made available and their application in replacement of the older type fuses has resulted in a benefit to the system at a relatively small cost.

By combining these changes with a steadily followed program of transformer maintenance and installation inspection, a definite service improvement has been obtained at an almost negligible increase in investment. These items have decreased the outages due to lightning on the system with which I am associated at an average rate of 5 per cent a year during the past eight years.

A similar program is now in operation on an eight-year schedule basis to include necessary replacement of poles and guys, rearrangement of conductors, trimming of trees, and so forth. In the areas so far included, this plan has given a still further reduction of outages during storms. A large part of this maintenance is necessary in any case, and our schedule and additional work plan have

effected a reduction in long-time outages at a cost comparable with the cost of repairs following trouble.

The electric distribution systems will benefit by the use of the newly developed transformer core iron and winding methods. The improvement in losses, voltage regulation, and manufacturing technique are not yet appreciated fully. It is probable that the present period of this development will in the future take its place alongside the period of 1906 to about 1910, as a great forward stride in the history of transformers. It is fortunate that parallel with this transformer development the manufacturers and the utilities have been able through a joint technical committee to further the standardization of many details of the transformers for general distribution service. These changes mean a saving of a few dollars on each transformer and, by the standardization, our construction crews can save a few items of hardware and a crossarm. While representing only a few dollars at each installation, it will in the aggregate amount to a very sizable sum as time goes on.

It is probable that similar improvements can be made in arresters, primary fuses or switches, voltage regulators, and other service devices. Further development of this equipment, essential in any general plan of distribution, should not be overshadowed by that of new devices and ideas.

Another example of investment economy possibility has been pointed to by a subcommittee of the Transmission and Distribution Committee in a series of studies and papers on transformer loading practices. It was noted that maximum loading permitted, load checking method used, and results obtained varied considerably among the companies cooperating in the survey. Starting with information developed in cooperation with transformer manufacturers, a sound procedure for loading on a temperature basis was determined. Based on load tests over a wide range of densities and characteristics, the influence of particular conditions were evaluated and the different methods of checking actual loads on a routine basis were reviewed. All this information has been made available to our industry through E.E.I. publications. That this subject deserves management attention may be realized from figures on the investment involved. Distribution transformer investment has been given as about 15 per cent of the total investment to serve residential and small commercial load. It is probable that there are systems with an average loading of as low as 50 per cent, while others, by taking full advantage of the temperature rise basis possibilities, are operating with 100 per cent average or even higher. An example that was given in one of the papers on this subject referred to a three million dollar transformer investment where the annual operating costs for testing, inspection, and changing or relocating transformers due to an over- or under-load condition, were approximately $30,000 a year. It is evident that even a small decrease in the installed transformer capacity or, putting it another way, a small increase in load on the present transformer capacity would justify an appreciable increase in operating cost for such a program.

In the field of voltage control we must maintain our wire sizes, regulation, and standards of service. Availability of low-cost voltage boosters developed by manufacturers has helped extend the area of economic voltage control. Similarly, auto-transformers have been useful for improving transformer-secondary impedance conditions in conjunction with growth of load due to appliance motor operation. We have made these additions to take care of the increased load, but we have also been required to add investment to keep the system free from lamp flicker produced by motor-starting currents.

We all realize the inadequacy of present building wiring for these modern day loads, but it might surprise us if we knew what this inadequacy has cost us because we have tried to handle the lamp flicker problem entirely on our supply system. Quite a contributing factor to this lamp flicker trouble has been the low quality motor on household appliances. Starting currents of such motors, entirely out of line with energy consumption possibilities, have often required uneconomic additions to the distribution system to satisfy customer complaints. The distribution system operators should have a definite interest in wiring promotion plans, and their policies in handling voltage complaints should be such as to permit the customer to obtain a full understanding of the cause of the trouble.

Distribution systems are made up of large numbers of small units spread over wide areas. They are being changed and added to every day. They must operate without direct supervision, practically without interruption, and in constant view of the public. This is in contrast to the generating station where there are a few large units closely supervised by personnel aided by comprehensive installations of meters and gauges.

Multiplication is a prime factor in a distribution system. While it costs little to add one item, a large sum is involved before the application is completed on the system. Every new idea, every individual opinion, and each new tool developed, must be subjected to the test: What does it contribute to the economics of supply and to the service requirement?

We have come a long way with electric distribution and still have a long way to go. A mutual understanding between manufacturers and operators and a full understanding of customers' requirements by both will do much to straighten and shorten the road.

Engineering Opportunities

(*Continued from page* 274)

from all NEMA manufacturers in ratings up to and including 25 kva, 15,000 volts and below, single-phase, pole type. These new standard transformers embody all truly essential features, but set up in schedules of accessories available as extras, items which are not required by a majority of users.

Simplified mounting direct to the pole, interchangeable between all makes and between considerable ranges of sizes, is a basic feature and in itself nets considerable saving in purchase price. Crossarm mounting, however, is still entirely practicable but requires accessory hangers that are not a part of the standard transformers.

In addition to reduction in manufacturing costs, with this new standard transformer in predominant use, substantial gains can be realized through simplification and convenience in field construction and operation. In this the feature of interchangeability is prominent. Any transformer, regardless of make, can be taken off its mounting bolts and another easily put in its place for any size up to 25 kva inclusive.

The elimination of crossarms also contributes a considerable saving.

Field savings running up to $7.00 or more per installation have been variously estimated by companies contemplating adoption of the new standard transformer. One company that already has had field experience reports an average field cost reduction of $3.85 per unit.

Another advantageous feature of in-

(*Continued on page* 288)

Wisconsin Public Service Corporation Wins Coffin Award

WISCONSIN PUBLIC SERVICE CORPORATION received at the EEI convention the Charles A. Coffin Award—top-ranking competitive prize in the electric industry—awarded annually to the company making the most distinguished contribution to the industry for the convenience of the public and the benefit of the industry.

The Award consists of a gold medal, a certificate of accomplishment and $1,000 in cash for the employee benefit fund of the winning company. The Award was announced by James E. Davidson, President of the Nebraska Power Company and member of the Prize Awards Committee of the Edison Electric Institute at the first general session of the Institute's annual convention and received in behalf of the company by C. E. Kohlhepp, Vice-President and Controller.

In making the announcement, Mr. Davidson said, in part: "This award, established in 1922 by the General Electric Company, in honor of the memory of one of the great leaders of the electrical industry, the late Charles A. Coffin, founder of the General Electric Company, is given each year to the electric utility which has made a distinguished contribution to the electric light and power industry for the convenience of the public and the benefit of the industry. It is the most prized award for which electric utilities can compete and to win it is rightly esteemed a great honor and distinction.

"The committee of judges found the other splendid presentations submitted this year for the Coffin Award to be closely on a parity, each excelling in certain respects. The company which has been selected by the judges as the winner of the 1940 Award presented a record of many noteworthy accomplishments. It supplies over 200 communities, none of them large, scattered over a wide area. A large percentage of its customers are rural and a substantial part of them live on farms, the company having been a pioneer in rural electrification. It has an extensive transmission and distribution system and operates a combination of hydroelectric and steam generating plants. The accomplishments of the winning company which most impressed the judges were as follows:

Charles A. Coffin Award Presentation — Stuart Crocker of the General Electric Company, representing the donor and C. E. Kohlhepp, Vice-President of the Wisconsin Public Service Corporation, the company winning the Coffin Award.

"It has made noteworthy gains through a planned program to improve internal efficiency. Its achievements in accounting and control are outstanding.

"It has been able to achieve a marked improvement in its financial structure and earnings through the refinancing of bonds and preferred stocks, the sale of additional common stock, the reduction of operating costs, and through increased sales.

"A well planned, original, and effective sales program accomplished splendid results in the sale of I.E.S. lamps and major appliances, and increased revenues in the face of substantial rate reductions.

"The company has an outstanding safety record and excellent employee and public relations. It is a pioneer in the adoption of a guaranteed annual wage plan.

"It has improved its plant facilities and its operating methods, effecting a substantial decrease in production and distribution costs.

"These and many other accomplishments give evidence of well developed plans and notable progress in their execution to insure a high quality of service over a widely scattered area at comparatively low rates."

Judges for the Coffin Award were Dr. Karl T. Compton, President of Massachusetts Institute of Technology; H. P. Liversidge, President of Philadelphia Electric Company and Chairman of the EEI Prize Awards Committee, and C. W. Kellogg.

Report of the Prize Awards Committee

By James E. Davidson

Member, Prize Awards Committee, Edison Electric Institute

Presented at the First General Session of the Ninth Annual Convention of the Edison Electric Institute, Buffalo, N. Y., June 3, 1941

I WANT to tell you that the judges of the respective prize awards that I will presently announce are the real heroes of this occasion.

Theirs was the job, and I assure you it was no light or conscienceless one, of examining, reading, comparing, re-examining and finally deciding to the best of their abilities on the merits of the many entries in the several prize contests. I know from past experiences as a judge that decisions are often difficult to make; that the difference in merit between a winning and a losing entry is often but a hair's breadth; that the relation between a first and second award does not have the mathematical relation of one to two.

Theirs was the task of selecting the winners, theirs the rueful knowledge that they may be targets for any loose brickbats that might be lying around. At most they have the satisfaction that come from doing a conscientious job.

I reiterate that the judges are the unsung heroes of these ceremonies and I want them to know that my fellow members of the Prize Awards Committee, Mr. Liversidge and Mr. Kellogg and myself appreciate to the fullest their services.

I want to thank on behalf of the Institute those who have made the awards possible by supplying the funds necessary to their establishment. I know they can derive satisfaction over the knowledge that through these awards they have been responsible for stimulating real contributions to the advancement of the electric light and power industry.

To all the contestants for the awards, let me express my thanks for their participation in these contests.

I am happy to report that the entries from companies and individuals covering specified activities and accomplishments increased considerably over last year, 125 entries and exhibits being made in this group. On the other hand, I regret to note a falling off in the number of papers on specified subjects submitted by individuals. There were 68 of these papers. But in the consideration of general conditions during the year, the showing has been remarkably good, both in numbers and in quality of entries.

MR. DAVIDSON

J. R. Jarnagin, Carolina Power and Light Company, winner of the B. C. Forbes Prize.

The B. C. Forbes Prize

This is a cash award of $250 donated by Mr. B. C. Forbes, Editor of *Forbes Magazine*, for the most meritorious paper dealing with the subject of public relations in the electric light and power industry. Mr. Forbes, as many of you know, has for several years offered this prize annually, and it has done a great deal towards stimulating thought and action on this important subject. The judges for the Forbes prize are Mr. G. W. Van Derzee, Vice President and General Manager of the Wisconsin Electric Power Company, Mr. T. D. Crocker, Vice President of Northern States Power Company, and Mr. Roy Page, Vice President of the Nebraska Power Company.

The judges have nominated Mr. Joseph R. Jarnagin of the Carolina Power and Light Company, Raleigh, N. C., as the winner of the Forbes Prize for his paper entitled "Public Relations Cannot Be Improved by Magic." Honorable mention is accorded to Mr. Kimball I. Jack of the Washington Water Power Company, Spokane, for his paper "Public Relations in the Electric Light and Power Industry" and to Mr. Leonard V. Smoot of the Cincinnati Gas and Electric Company for his paper "Avenues of Approach."

James H. McGraw Prizes

These prizes were established some years ago by Mr. James H. McGraw, Honorary Chairman of the McGraw Hill Publishing Company, as incentive, and encouragement to original thought and research in the broad field of electrical engineering. Three prizes are offered for the most meritorious papers on any engineering or technical subject relating to the electric light and power industry.

The judges for this award are Mr. R. N. Conwell, Public Service Electric and Gas Company, Newark; Mr. Frank R. Innes, Managing Editor of *Electrical*

James H. McGraw Prize Winners—S. B. Williams representing Mr. McGraw; E. B. Woodruff, one of the second prize winners; J. M. Mousson and W. B. Hess, joint winners of the first prize, and Frank F Fisher, winner of the third prize.

World, and Mr. W. A. Shoudy of the firm of Orrok, Myers and Shoudy, consulting engineers.

The first McGraw prize, $250 in cash, is awarded to Messrs. W. B. Hess and J. M. Mousson of the Safe Harbor Water Power Corporation, Baltimore, Md., for their paper entitled "More Power Through Higher Operating Efficiencies of Hydro Electric Power Plants." The second McGraw prize of $150 in cash is awarded to Messrs. H. B. Lammers and E. B. Woodruff of the Cincinnati Gas and Electric Company for their paper, "Combustion Analysis in the Modern Boiler Unit." The third prize, $100 in cash, is awarded to Mr. Frank F. Fisher of the Detroit Edison Company for his paper on "A New Method for the Uniform Rolling-In of Condenser Tubes."

The Claude L. Matthews Award for Valor

This award is offered annually by Mr. Claude L. Matthews, vice-president of the W. N. Matthews Corporation, for acts of devotion to duty by public utility company employees wherein extraordinary courage has been exercised to maintain important electric service or to restore service in the shortest possible time.

The judges of this award, Mr. A. E. Silver, Ebasco Services Incorporated; Mr. W. R. Smith, Public Service Electric and Gas Company, and Mr. N. M. Argabrite of the American Gas and Electric Company, have awarded a citation, a lapel decoration, and a cash prize of $150 to Mr. J. B. Handley of the West Texas Utilities Company, Abilene, Texas.

The judges citation of Mr. Handley's

Augustus D. Curtis Award winners—F. J. Vorlander, seated, Darwin Curtis, one of the donors, and J. E. Pittinger. Mr. Vorlander and Mr. Pittinger were the recipients of the cash award accompanying the Curtis first prize which went to their company, the Philadelphia Electric Company. Standing, W. L. Argus of the New Orleans Public Service Inc., winner of the third prize and E. G. Mortensen, of the Nebraska Power Company, winner of the second prize.

Darwin Curtis, holding a Special Award to the Appalachian Electric Power Company. The recipients of the cash award are R. S. Musgrave and R. E. Wagenhals.

J. B. Handley, winner of the Matthews Valor Award, demonstrating how he used a piece of ordinary slick wire to improvise a stirrup to climb seven poles to make repairs during the snowstorm of February 16 and 17, 1940.

action that is commemorated by this award, reads, "During a severe snow and wind storm in the neighborhood of Childress, Texas, on February 16 and 17, 1940, J. B. Handley, Lineman, employed by the West Texas Utilities Company, traveling alone on foot, carrying only his lineman's pliers, all other equipment and materials having been deliberately left behind to reduce the difficulties of travel, on his own initiative and at great personal risk, patrolled ten miles of transmission line through deep snow, improvised means of climbing ice-coated poles, made necessary pole-top repairs and restored service to the towns of Quitaque and Turkey in the shortest possible time. By his action he showed a high measure of foresight, courage, resourcefulness and determination well beyond the reasonable demands of duty."

The Augustus D. Curtis Award

This award comprises two certificates of accomplishment offered by Messrs. Darwin and Kenneth Curtis of Curtis Lighting, Incorporated, in memory of Augustus D. Curtis, to the public utility operating companies in the United States which, during the 12-month period ending March 1, 1941, have shown distinguished contribution to the advancement of higher levels of artificial illumination in the interiors of commercial buildings, and four cash prizes go to the individual or individuals in public utility companies who were responsible for the achievement.

The judges for this award are Mr. A. D. Cameron, Illuminating Engineering Society, New York; Mr. J. F. O'Brien, John B. Pierce Foundation, New York, and Mr. O. Fred Rost, Wholesaler's Salesmen, New York.

First prize in the Curtis Award goes to the Philadelphia Electric Company, the certificate to the company and the cash prize of $200 to Messrs. J. E. Pittenger and F. J. Vorlander of the company.

The second prize, I am very gratified to announce, is awarded to the Nebraska Power Company, Omaha, Neb., and I accept the certificate for the company with great pleasure. The cash prize to the individual responsible for the achievement goes to Mr. E. G. Mortensen of our organization.

The third prize, consisting of a cash award of $50 is awarded to Messrs. J. M. Guillory and W. L. Argus of the New Orleans Public Service Incorporated.

The fourth prize of $25 goes to Mr. Gerald H. Preacher of the South Carolina Electric and Gas Company at Columbia, S. C.

Honorable mention is accorded to Mr. Harry Curtis of the South Carolina Power and Light Company at Charleston; Mr. William S. DeHaven of the Atlantic City Electric Company and Mr. Jerome S. Culligan of the Fort Dodge Gas and Electric Co.

I am pleased also to announce that upon unanimous recommendation of the judges, the Augustus D. Curtis Award is broadened this year to include "A Special Award of a Certificate to the Appalachian Electric Power Company, Huntington, W. Va., for a unique exhibit which ingeniously dramatizes the significant comparison of the old and new in relighting arrangements; and $25 in cash to Messrs. R. E. Wagenhals and R. S. Musgrave who were responsible for the concept of this automatic model demonstration."

The George A. Hughes Award

The George A. Hughes Award, established by Mr. George A. Hughes, Chairman of the Board of the Edison General Electric Appliances Company, Inc., consists of a trophy, certificates and cash prizes. It is offered to the operating utility companies and to individuals in those companies whose work and cooperative efforts show the greatest contribution to the development of the market for electric ranges through direct or cooperative promotion or selling, or both, during the year 1940.

Judges of this contest are Mr. Henry G. Dooley, *Electrical World*, New York, Mr. Arthur P. Hirose, *McCall's Magazine*, New York, and Mr. W. J. Daily, Roy S. Durstine Inc., New York.

George A. Hughes presentation—Harry Restofski, winner of the third prize; R. B. McElroy, winner of the second prize and H. G. Isley of the Carolina Power and Light Company, winner of the trophy. George A. Hughes, the donor, is shown on the right.

H. E. Simpson receives for his company, The Florida Power and Light Company, the second prize in the Modern Kitchen Bureau Water Heating Award; J. R. Poteat, Chairman, Electric Water Heating Section of NEMA; Kinsey Robinson, President, Washington Water Power Company, the company winning the first prize, a silver trophy and $500 in cash; and F. A. Coffin receives for his company, The Wisconsin Electric Power Company, the third prize in this contest.

The Carolina Power and Light Company, Raleigh, receives first honors in the Hughes Contest, a trophy. To Mr. H. G. Isley, General Sales Manager, Trustee, of the company, goes a check for $500 as the individual responsible for the achievement which was based on large volume of sales without subsidies, bonuses, free wiring or undue trade-in practices.

The second prize, a certificate of accomplishment and a cash prize of $300 is awarded to the Washington Water Power Company, Spokane.

The third prize is awarded to the West Penn Power Company, Pittsburgh. The certificate to the company, and a $200 check to Mr. Harry Restofski, under whose direction the range selling activity was conducted.

Both the Washington Water Power Company and the West Penn Power Company obtained a large volume of sales through vigorous operation of comprehensive sales and promotional programs in which customer education and dealer development played an important part.

Modern Kitchen Bureau Water Heating Award

The Water Heating Award of the Modern Kitchen Bureau is a silver trophy and three cash prizes offered to the operating companies which accomplished the best all-around promotion and sales of electric water heaters during 1940. Mr. J. R. Poteat, Chairman, Electric Water Heating Section of the National Electrical Manufacturers Association, will represent the donor of this award.

The judges for these awards are Mr. Henry G. Dooley, *Electrical World*, Mr. Luke J. McCarthy of Hearst Magazines, Inc., and Mr. Walter Daily of Roy S. Durstine, Inc.

The first prize consisting of a silver trophy and $500 in cash is awarded the Washington Water Power Company, Spokane, Wash. The company conceived an unusually thorough plan of operation for 1940, and pursued it with vigor. The excellence of the execution of its program is attested to by the fact that the company sold 46.2 water heaters per thousand residential customers. Secondly, it sold 3257 water heaters during the year, and thirdly, increased its percentage of sales over 1939 by 32.9 per cent.

This is the second successive year in which this company has won the National Water Heating Award, and I am sure that Kinsey Robinson, President of the Company, is entitled to all the pride which he may exhibit over this accomplishment.

The second prize of $300 in cash is awarded to the Florida Power and Light Company, Miami, Fla. To meet the unusual demands of a transient, unstable and highly competitive market, the company designed and carried out a comprehensive program. As evidence of the competent execution of its plan, 28 water heaters per thousand residential customers were sold, a total of 3252 for an increase of 28.1 per cent over the sales in 1939.

I would like to say also that for their splendid accomplishments embraced within the terms of this award, the judges have accorded honorable mention the Portland General Electric Company, the Idaho Power Company and the Knoxville Electric Power and Water Board.

The Thomas W. Martin Award

This award is a bronze plaque offered by Mr. Thomas W. Martin, President, the Alabama Power Company, to the public utility operating company within the United States, which during the year 1940 has shown the greatest contribution to the agricultural advancement within the company's territory through promotion of uses of electricity, development of rural load, cooperation with

C. H. Leatham holding the Thomas W. Martin plaque which was awarded to his company, the Monongahela West Penn Public Service Company.

R. B. Marshall Award Winners—A. W. Zagray, L. N. Rothermel, A. B. Coleman and R. B. Marshall, donor of the award.

other agencies, extension of rural lines, organization and planning for development of rural electrification.

The judges for this award were Mr. George W. Kable, Editor of *Electricity on the Farm;* Prof. W. C. Krueger, New Jersey State Agricultural College, New Brunswick, N. J., and Col. William M. Mumm, of Mumm, Romer, Robbins and Pearson, Inc., Columbus, Ohio.

The winner of the Martin Award this year operates in some 30 counties of a region where the topography is extremely rugged, and farms small, averaging 90 acres. The agriculture is, for the most part, diversified and the average cash income of the indivdual farmer is reported to be among the lowest in the United States, $360 per farm.

Since 1936, more than 2000 new rural customers have been added to the company's lines each year, embracing in all, about 3000 miles of new construction at a cost of approximately $3,000,000. This program of rural electrification reached its climax in 1940 when 2269 new rural domestic and commercial users were connected to the lines or were listed on projects negotiated for immediate construction. The great majority of these were strictly farm customers. These users are found on 546 indivduail extensions, with a total cost of construction of more than $612,000. The company expects similar results in 1941 and succeeding years from its rural electrification program.

The company establishing this record and adjudged the winner of the Martin Award is the Monongahela West Penn Public Service Company.

The R. B. Marshall Awards

An award of $500 divided into five equal prizes of $100 is offered by Mr. R. B. Marshall, President of Electromaster, Incorporated, to utility representatives who sold, leased or rented during the calendar year, 1940, the greatest number of individual domestic electric ranges of a rated capacity of five kilowatts or more. There are five classifications, according to the number of customers served. In arriving at the winners, a point system was used, allowing one point for each range rented or placed on trial, and two points for each range sold.

The judges of these awards are Mr. C. W. Cleworth of Electrical Publications, New York; Mr. James H. Nelson of Ralph H. Jones Company, New York, and Mr. L. E. Moffat of *Electrical Merchandising,* New York.

In Group One, utility companies serving up to 25,000 customers, the winner is Mr. A. B. Coleman, Kingsport Utilities, Inc., Kingsport, Tenn. Mr. Coleman was the winner of this same award in 1940. If Mr. Coleman repeats this performance next year, I suggest that he is entitled to a silver loving cup for his permanent possession in addition to the monetary prize. Competitors in this classification could well hope that possession of the cup would disqualify Mr. Coleman for further competition.

In Group Two, serving from 25,000 to 50,000, the prize goes to Mr. Charles L. Doane, The Kansas Power and Light Company, Topeka, Kansas.

In Group Three, which includes utilities serving from 50,000 to 100,000 customers, the winner is Mr. Levan N. Rothermel of the Northern Indiana Public Service, Inc., Hammond, Ind.

Honorable mention is accorded to Frank Eby of the Dayton Power & Light Company who was a close competitor in Group Three.

In Group Four, serving from 100,000 to 250,000 customers, the award goes to Mr. Arthur W. Zagray of the Ohio Power Company, Canton, Ohio.

In Group Five, from 250,000 customers and up, the winner is Mr. Robert J. Burgh of the Detroit Edison Company. Mr. Burgh also won this same award in 1940, and what I said regarding Mr. Coleman also applies to Mr. Burgh.

Laura McCall Award

This is the initial presentation of this award, an engraved plaque, two illuminated parchments and a total of $175 in cash offered by *McCall's Magazine,* in memory of the late Laura McCall, for outstanding achievements by the Home Service departments of operating public utility companies in the advancement of electrical living in the home through the promotion of electrical appliances and home lighting equipment.

The judges of this award are Miss Eloise Davidson, *Herald Tribune Institute,* New York; Mrs. Helen Judy Bond, Columbia University, New York, and Mr. Davis M. DeBard of the Stone and Webster Service Corporation, New York.

The Atlantic City Electric Company receives the first prize, the plaque, and to Miss Elizabeth Murray, Home Service Director, goes a cash award of $100.

The second prize, an illuminated parchment, goes to the Idaho Power Company, Boise, Idaho, and to Miss Margurette Reinhart, Home Service Director, the cash award of $50.

The third prize, a parchment, goes to the Indianapolis Power and Light Company, Indianapolis, Ind., and to Miss Leona Berlin, Home Service Director, the cash award of $25.

Honorable mention is accorded to Miss Fern Snider, Home Service Director of the Georgia Power Company, Atlanta, and to Miss Mary N. Rigby,

Miss Elizabeth Murray of the Atlantic City Electric Company, the company awarded the first Laura McCall Award; Miss M. Davies, representing the donor and Miss Leona Berlin of the Indianapolis Power and Light Company, winner of the third prize.

Ashton B. Collins, donor of the Reddy Kilowatt Award and Charles R. Preston, Kansas Gas and Electric Company, Wichita, holding the Reddy Kilowatt Plaque won by his company.

Home Service Director of the Brockton Edison Company, Brockton, Mass.

Reddy Kilowatt Award

The Prize Awards Committee has been asked to make the presentation of the Reddy Kilowatt Award offered by Ashton B. Collins.

This award is a bronze plaque offered to the company that best illustrated, humanized and simplified its 1940 Annual Report to Stockholders. The judges of this contest were: Mr. Merryle S. Rukeyser, economic commentator for the International News Service; Col. H. S. Bennion, vice-president and managing director, Edison Electric Institute, and Mr. S. B. Williams, editor of *Electrical World*.

The judges were impressed with the number and character of the entries showing a tendency on the part of electric utilities toward a more understandable and appealing statement of the operations and accounts of the companies. This is in line with the general trend of corporate reports to become documents which create better understanding of American economic life, thus becoming more revealing and more educational.

The Kansas Gas and Electric Company of Wichita, Kan., has been adjudged the winner of this prize on the basis of orderliness, completeness and informative values of its report, telling in short, simple fashion the things an investor would want to know about the operations of his company; and including supporting, accounting data, for its arresting cover design, for its summary of business conditions in the territory served and its statement detailing in "human interest" fashion.

The judges have accorded honorable mention to the Annual Reports of other companies as follows:

To the Wisconsin Gas and Electric Company of Racine, Wis. (for the simplicity and readability, the choice of paper and printing and table of contents of its report).

To the Illinois Iowa Power Company, Decatur, Ill. (for the simplicity of treatment of its data and informal and free discussion of its problems with its stockholders).

To the Union Electric Company of Missouri of St. Louis, Mo. (for its candor, completeness, and combination of the better elements of modern practices with past dignity of treatment).

And to the El Paso Electric Company, El Paso, Tex. (for its report which, though not technically a report to stockholders, was an especially competent example of popular treatment of company affairs).

The Edison Electric Institute Medal

The Prize Awards Committee is also charged with the administration of the Edison Electric Institute Medal, which is awarded in recognition of the successful resuscitation by the prone pressure method of individuals suffering from electric shock. There have been 13 Institute medals awarded to employees of electric utilities for saving of lives since June last year. The total number awarded since the inception of the medal in January, 1933, is 103 medals. The committee of judges awarding this medal are Mr. Wills Maclachlan, chairman, Mr. W. R. Smith and Miss M. B. Woods, secretary.

Those who have been awarded this medal during the past 12 months are: Arnold F. Ross, Superior Water, Light and Power Company, Superior, Wis.; Roy J. McQuaid, Superior Water, Light and Power Company, Superior, Wis.; Axel E. Melander, Washington Water Power Company, Spokane, Wash.; Malcolm R. Roache, Pennsylvania Power

(*Continued on page* 232)

Sales Training Films Will Find Many Uses

VAGRANT thoughts of a typical utility sales manager:

"This 'draft' sure has the right name . . . it's blown away my best salesmen! Boy, how I miss Jones and Smith. They were real top-notchers—and now they're meeting top-sergeants! 'They'll Do It Every Time'—my best men had to be first.

"What a load-building job I could do today! Folks sure have plenty of money to spend . . . and they're not spending it on champagne and silk shirts —not this time! Look at those sales figures—even with cubs doing the selling, our domestic load is booming. And make believe we won't need that load when Adolf is G W T W!

"We could do better, though . . . I know it! The quicker our new men are trained, the quicker I can get this sales force back to par, the quicker we'll all make money!"

* * *

To aid harassed sales managers both in the intensive training of new men, and in effectively reminding veterans of sales methods they tend to forget or overlook. The Modern Kitchen Bureau has prepared a series of 10 sound-slide sales training films, now ready for use.

Five basic sales training films will give the concrete facts every salesman needs in selling any appliance. Their titles are: "How to Build a Prospect List," "Getting the Right Start," "Demonstrating to Sell," "Answering Objections," and "How to Close."

Five product films, dealing with specific appliances, yet not mentioning particular makes, will cover in detail the selling of electric refrigerators, ranges, water heaters, washers and ironers, and roasters.

Plenty of work has gone into the preparation of these films. Experts in appliance selling and in film work have gone over the slides and scripts with care, to be sure that these films will do a good job.

The films will be of value to every salesman. Veterans will appreciate the opportunity to review their knowledge; the cub will profit by a dramatic presentation of the facts he needs to increase his income and that of the company.

The essential purpose of the films is the review of facts already recognized by most salesmen, but not used by all of them, nor to the correct degree by the others. As one experienced salesman said after seeing two films: "Well, they remind me of things I used to do, but for some reason have forgotten. They put together a pattern that brings back all I know, but does it in an orderly fashion and gives me a new start toward more sales."

The Modern Kitchen Bureau suggests that these films will be shown most effectively at meetings of not more than 20 men, and when combined with discussion periods to drive home the effectiveness of sales points shown in the films. Each film will come with questions and answers for quiz sessions that can be held with the showing of each film, and with manuals containing suggestions for profitable use of the films.

The films will be priced on a sliding scale, per-meter basis. Cost is as low as possible to insure widespread use. Full information on the films is now being circulated in a special announcement.

The time at which these films appear makes them especially significant. With defense orders putting more money in more pockets everywhere, the market for electrical appliances is booming. Keen competition—and that's a mild word—for a share of this market makes the efficiency of every sales force a matter of paramount importance. With necessary replacements in man power, shortages of appliances, etc., adding to the problems of the sales manager, The Modern Kitchen Bureau believes that this series of films will prove to be of real assistance to utility sales departments in the days to come.

Information on these films may be secured from The Modern Kitchen Bureau, 420 Lexington Avenue, New York City.

No woman likes drudgery . . . scenes from an old-fashioned home dramatize the advantages of your appliances.

When prospects are dissatisfied, time is working for the appliance salesman.

Supplement to First Report

EEI-NEMA Joint Committee on Standards for Distribution Transformers

NOTE: In the May issue of the BULLETIN attention was called to the approaching publication of the Joint Committee Second Report which will extend the new EEI-NEMA Distribution Transformer Standards upward in size to 100 kva inclusive. Also mention was made of certain minor modifications in the First Report, coming about through the studies embracing the wider coverage of the Second Report. These modifications, as approved by both EEI and NEMA, are here set forth. Items are identified by specific paragraph references to the First Report.

EEI Publication No. G6
NEMA Publication No. 106
dated February, 1940

This supplement to First Report includes extensions or minor modifications to distribution transformers 25kva and below. These changes will be put into effect by the manufacturers as rapidly as facilities and materials permit. All paragraph and page references are to the First Report.

Page 5, Paragraph IIBI—Transformers rated 12,000 or 13,200-volts high-voltage shall be supplied with four 2½ per cent taps below normal on the high-voltage side instead of two 5 per cent taps shown previously.

Page 5, Paragraph IIBI and B2—All taps shall be rated kva unless otherwise indicated. The lowest tap on the 7200-volt rating (86½ per cent of rated voltage), shall be reduced kva rating. Transformers rated 8660-volts delta or less, may be connected Y, and the nameplate shall be so marked on the high-voltage side for all transformers having high-voltage ratings above 600-volts. Transformers with low-voltage rating of 120/240 volts shall be suitable for series, parallel or three-wire operation at full kva rating. Transformers having low-voltage rating of 240/480 volts shall be suitable for series or parallel service at full kva rating.

Page 5, Paragraph IIB2—Add 1½ to 25 kva transformers rated as follows:

Group 1—4160-volts high-voltage 120/240 volts low voltage with four 2½ per cent taps below 4160 volts.

Group 2—4160-volts high-voltage, 240-480 volts low voltage with two 2½ per cent taps above and two 2½ per cent taps below 4160 volts.

Group 3—4160-volts high-voltage, 600-volts low-voltage, with two 2½ per cent taps above and two 2½ per cent taps below 4160 volts.

Page 6, Paragraph IIIBIb—Add footnote to tabulation: "On conductor opening of 5/16 in. a plus tolerance of ⅛ in. will be permitted. On 25 kva transformers with 120/240 volts low-voltage, change X3 terminal to ⅝ in."

Page 6, Paragraph IIIBI—Add: "c. Low-voltage terminals shall be in accordance with Figure VI appended. All connector clamping bolts shall be ⅜, ½, ⅝ or ¾ in. and shall have American National Standard, Coarse Series Threads, Class 2 Fit."

Page 7, Paragraph IIIB4—Add: "Low-voltage bushings shall be of sidewall or pocket type."

Page 7, Paragraph IIIB5—Add:

"c. The identification of low-voltage internal and external connections shall be shown on the nameplate and shall conform to Figure I, appended.

"d. Internal leads shall be individually tagged with the letters A C B D as shown in Figure I unless a lead support or other means is provided to locate such leads definitely with respect to each other. Where lead supports are used, the leads at the top or terminal side of the lead support shall be in the order A C B D reading from left to right facing the low-voltage side."

Page 7, Paragraph IIIC1—Add the following:

"Nameplate shall show temperature rise.

"The nameplate pad shall be extended or an additional pad provided immediately below the nameplate for attaching users data.

"Pad extension shall have minimum horizontal width of 3¼ in. and shall be provided with two holes 3 in. between center lines and 0.104 in. diameter.

"Pad extension shall extend 1 in. vertically below nameplate with center lines of holes ½ in. vertically below nameplate.

"Supplemental data and instructions applying to transformer shall state that the holes in the pad extension may be tapped for 6/32 machine screw or used without tapping for self-tapping screw. It shall also state that the length of any machine screw or self-tapping screw used in these holes shall be 5/16 in. plus or minus 1/16 in.

"Supplemental data and instructions shall be available showing gallons of oil required by transformer, and the weight of the transformer."

Page 7, Paragraph IIID3b—Change to read: "All other transformers having one high-voltage bushing shall have an external link securely bolted between the tank and the low-voltage neutral terminal."

Page 7, Paragraph IIID2 and IIID3c—Insert word "steel" before "pad."

Page 7—Add: IIIJ—INTERNAL GROUNDING PROVISIONS.

Page 7—Add: IIIJI—"On transformers having one high-voltage bushing, that end of the winding corresponding to the high-voltage grounded neutral (H_2 terminal) shall be connected to the tank internally. This connection shall be thoroughly and securely grounded to the tank and shall be completely independent of all other ground connections and of the low-voltage winding or low-voltage terminals."

Page 7—Add: IIIK—OIL LEVEL MARKING.

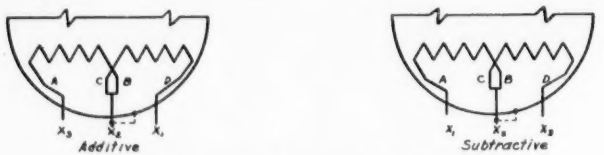
Page 7—Add: IIIK1—"The inside of the transformer tank shall be suitably marked to indicate the correct oil level at 25 C."

Page 8—Substitute Figure I Revised dated May 7, 1941.

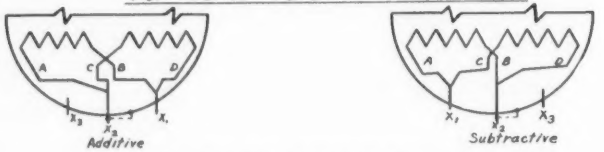
Page 9—Substitute Figure II Revised dated April 9, 1941.

Page 12—Substitute Figure V Revised dated May 7, 1941.

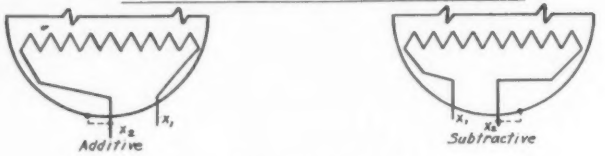
Page 13—(Inside Back Cover) *Add* Figure VI dated April 9, 1941.



Three-Wire Series-600 Volt Class and Below
For Series-Parallel Transformers



Two-Wire Parallel-600 Volt Class and Below
For Series-Parallel Transformers



Two-Wire Only
120 Volt Class

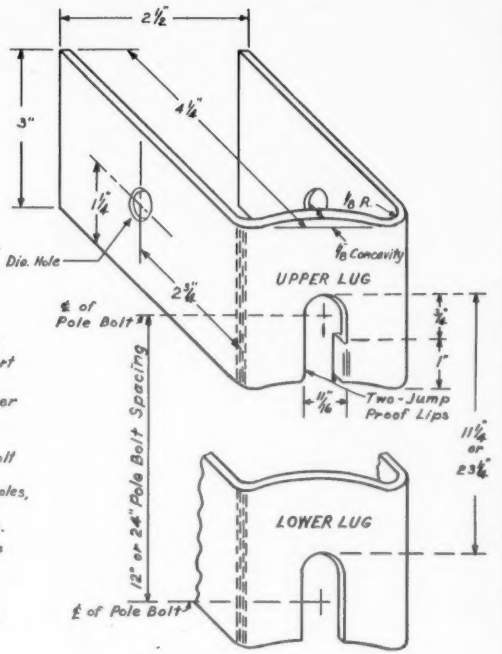
Two-Wire Only
Above 120 Volt Class

FIGURE I Revised
STANDARD
LOW VOLTAGE CONNECTIONS
FOR
DISTRIBUTION TRANSFORMERS
RATED 25 KVA & BELOW

May 7, 1941

First Report Supplement
EEI-NEMA Joint Committee On
Standards For Distribution Transformers

Figure I—Revised



NOTES:

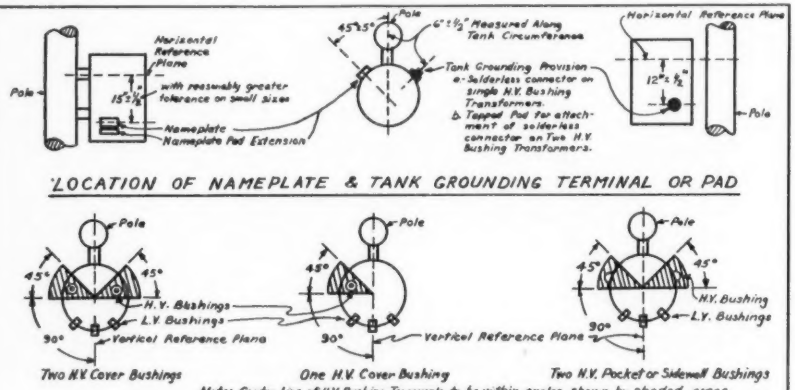
1.- Both Support Lugs No. 10 gauge USS (minimum) Steel.
2.- Support Lugs may be flanged for welding to tank, if desired.
3.- External side surfaces of support Lugs to be flat and parallel.
4.- Lower Support Lug same as Upper Support Lug except without Jump Proof Lips.
5.- For ease of entering bolts in bolt slots when mounting and for tolerance in boring pole bolt holes, Support Lugs are spaced at ¾" less than spacing of pole bolts.
6.- Tolerance for bolt slot dimensions shall be ± 1/16". - Tolerance for all other dimensions shall be ± 1/16".
7.- Both Support Lugs to be used with flat galvanized washer between Support Lug and pole.

FIGURE II Revised
STANDARD
NORMAL DUTY TRANSFORMER SUPPORT LUGS
FOR TRANSFORMERS RATED 25 KVA & BELOW

April 9, 1941

First Report Supplement
EEI-NEMA Joint Committee On
Standards For Distribution Transformers

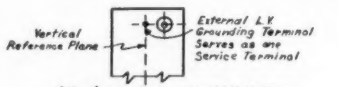
Figure II—Revised



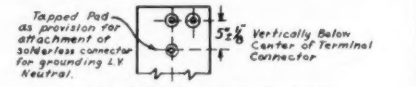
LOCATION OF NAMEPLATE & TANK GROUNDING TERMINAL OR PAD

Note: Center Line of H.V. Bushing Terminals to be within angles shown by shaded areas

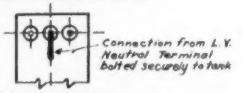
LOCATION OF HIGH VOLTAGE & LOW VOLTAGE BUSHINGS



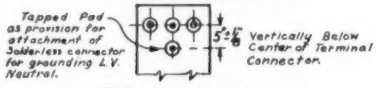
"A" - 1½ Kva - 2 wire L.V. - 120 Volt Class with one H.V. Bushing


Tapped Pad as provision for attachment of solderless connector for grounding L.V. Neutral.
5½"
Vertically Below Center of Terminal Connector

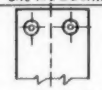
"B" - 1½ Kva - 2 wire L.V. - 120 Volt Class with Two H.V. Bushings



"C" - 3 Kva and above with one H.V. Bushing


Tapped Pad as provision for attachment of Solderless connector for grounding L.V. Neutral.
5½"
Vertically Below Center of Terminal Connector.

"D" 3 Kva and above with Two H.V. Bushings



"E" - 2 wire L.V. - Above 120 Volts

NOTE: Sketches C & D also apply to 1½ kva transformers having High Voltage Taps and 3 wire Low Voltage.

LOCATION OF LOW VOLTAGE BUSHINGS, LOW VOLTAGE GROUNDING TERMINAL OR PAD AND NEUTRAL CONNECTIONS

GENERAL NOTES: All angles are given looking down on transformer.
Horizontal Reference Plane is through top of Bolt Slot in Upper Support Lug.
Vertical Reference Plane is through center lines of transformer and pole.

FIGURE V Revised
STANDARD
LOCATION OF BUSHINGS, GROUNDING PROVISIONS & NAMEPLATE
FOR TRANSFORMERS RATED 25 KVA & BELOW

May 7, 1941

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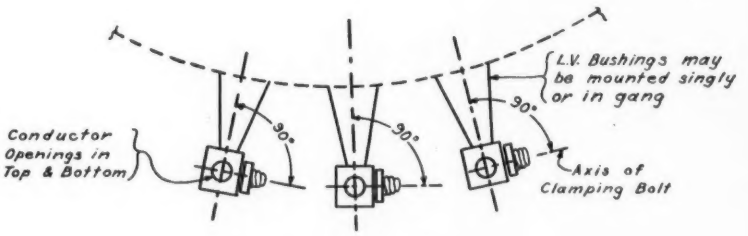
EEI-NEMA Joint Committee On
Standards For Distribution Transformers

Figure V—Revised



SCHEMATIC TOP VIEW

NOTES:

1. - Facing L.V. side of Transformer, connector clamping bolts shall be on Right Hand side of connectors.
2. - Axis of connector clamping bolts shall be horizontal and at right angles to center line of bushings.
3. - All threaded parts of connector shall be removable without removing L.V. bushings.
4. - All connector clamping bolts shall be ⅜, ½, ⅝ or ¾ inch and shall have American National Standard, Coarse Series Threads, Class 2 Fit.
5. - One or two connector clamping bolts may be used but U-bolts or J-bolts shall not be used.
6. - Connectors shall be arranged for conductors to issue directly upward or downward only.
7. - Size of conductor openings shall be in accordance with paragraph III $B_1 b$.
8. - Minimum spacing between L.V. bushing Terminals shall be:
   Between live metal parts in the working area $1\frac{5}{8} \pm \frac{7}{8}$"
   Between center points of bushing terminals 4" ± 2"

FIGURE VI
STANDARD
LOW VOLTAGE CONNECTORS
FOR
DISTRIBUTION TRANSFORMERS
RATED 25 KVA & BELOW

April 9, 1941

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Standards For Distribution Transformers

Figure VI

PERSONALS

After 35 years in the utility industry, JAMES G. ALLEN, retiring manager of the Lake Geneva, Wis., district of the Wisconsin Power and Light Company and president of the First National Bank of Lake Geneva, recently turned over active management of his district to CARL J. FORSBERG, former manager of the company at Darlington.

GEORGE J. BRETT, treasurer of western division companies of the Niagara Hudson System and assistant controller of Niagara Hudson Power Corp. has been elected controller of the Niagara Hudson Power Corp.

FRANK MCLAUGHLIN, president of the Puget Sound Power and Light Company has been appointed regional vice-president of the Navy League of the United States.

JAMES LITTLEFIELD, supervisor of the commercial service department of the Utah Power and Light Company, has been called to active army duty. A major in the Army Reserve, he has been succeeded in the utility by MAURICE DUSENBERRY.

CARL KELLY has been named manager of the Rio Vista branch of the Pacific Gas and Electric Co. LARRY FARRELL, formerly manager, has been transferred to the Suisin-Fairfield Office, succeeding GEORGE W. LEE, retired.

H. C. EDDY, purchasing agent of the American Gas and Electric Service Corp., has retired, effective June 1.

HARVEY A. KEYS, formerly manager of the promotion-of-business division of the Public Utility Engineering and Service Corp., at Chicago, has been transferred to the Northern States Power Co., Minneapolis, as manager of the sales promotion department, which is supervised by H. E. YOUNG, vice-president in charge of sales. HARRY J. SMEDLEY, also of the promotion-of-business department of the Public Utility Engineering and Service Co. has been transferred to Pittsburgh as a member of the sales department of the Duquesne Light Company.

GEORGE E. LEWIS, Manager of the Rocky Mountain Electrical League has received the American Trade Association's 1940 award of merit.

CONVENTIONS AND MEETINGS

JUNE

16-20 American Institute of Electrical Engineers, Summer Convention, Toronto, Can.
25-27 Canadian Electrical Association, Seigniory Club, Province of Quebec, Canada.

SEPTEMBER

22-25 Illuminating Engineering Society, Atlanta Biltmore Hotel, Atlanta, Ga.

OCTOBER

6-8 National Electrical Contractors Association, Rice Hotel, Houston, Texas.
6-10 National Safety Council's 1941 Congress and Exposition, Stevens Hotel, Chicago, Ill.
12-15 American Society of Mechanical Engineers, Louisville, Ky.
20-24 American Gas Association, Atlantic City, N. J.
27-31 National Electrical Manufacturers Association, Waldorf-Astoria Hotel, New York, N. Y.

DECEMBER

3-5 Congress of American Industry of the National Association of Manufacturers, Waldorf-Astoria Hotel, New York, N. Y.
3-5 American Institute of Electrical Engineers, Southeastern District, New Orleans, La., St. Charles Hotel.

C. E. BATHE, electrical engineer of the transmission-distribution department of the Oklahoma Gas and Electric Co. since 1936, was recently named as superintendent of engineering, succeeding the late Roscoe Schaeffer. PERRY L. SHELLEY, formerly assistant to Mr. Bathe, succeeds him as electrical engineer of the transmission and distribution department.

EDMUND C. STONE, vice-president and general manager of the Duquesne Light Company has been appointed chairman of the Pittsburgh Defense Council to work under the National Civilian Defense Council.

D. E. WINSLOW has been appointed purchasing agent of the West Penn System. He will succeed RUSSELL POE, who retired from active service June 1, after having been with the company 35 years.

J. H. FAIRLEY, a Pittsburgher and a graduate of Ellsworth School of Accounting, will become assistant purchasing agent.

W. A. GARBER, an engineer from the Lines Engineering Department at Washington, Pa., has been transferred to the newly-created position of buyer in the Purchasing Department.

FRANK R. PHILLIPS, president of the Philadelphia Company and subsidiary companies of Pittsburgh, Pa., has announced the appointment of WALTER H. ARRAS as general purchasing agent of the Philadelphia Company and subsidiary companies, succeeding C. W. LEPPER, retired, effective June 1. RUSSELL C. WENZ was appointed as assistant general purchasing agent, succeeding Mr. Arras.

Engineering Opportunities

(*Continued from page 276*)

terchangeable mounting is systematic arrangement and positioning of secondary leads and terminals with connectors of the solderless type. When changing out a transformer this standardization avoids cutting, splicing or reshaping of connections from secondary mains, which has been a substantial item of field expense, particularly where heavier conductors are used.

It is pertinent to know that the Joint Committee is continuing its work, with assurance the new EEI-NEMA Standard soon will be extended to cover transformers of sizes as large as customarily used for pole mounting.

Now, in conclusion, may I repeat my purpose in these remarks of encouraging study of some of the basically sound and not fully exploited distribution engineering practices that may be found helpful in meeting present heavy distribution load increases and at the same time conserving a maximum of materials and equipment, effort and money.

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1940-1941

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Prime Movers, E. L. HOPPING, Philadelphia Electric Co., Philadelphia, Pa.

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Rate Research, F. A. NEWTON, The Commonwealth & Southern Corp., New York, N. Y.

General Sales, R. E. FISHER, Pacific Gas & Electric Co., San Francisco, Cal.

Statistical, W. T. NEEL, Philadelphia Electric Co., Philadelphia, Pa.

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Codes and Standards (a Subcommittee of the Operating Committee)
(To be announced)

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